DOCUMENT RESUME

ED 316 419 SE 051 250

AUTHOR Sangster, Sandra; Crawford, Patricia
TITLE Effect of Sex-Segregated Mathematics Classes on Student Attitudes, Achievement and Enrollment in Mathematics: A. Y. Jackson Secondary School, Year II.
INSTITUTION North York Board of Education, Willowdale (Ontario).
PUB DATE Nov 86
NOTE 82p.; For related documents, see ED 276 734 for Year I and SE 051 251 for Year III.
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Attitude Measures; *Enrollment Influences; Females; Foreign Countries; High Schools; *Homogeneous Grouping; Interviews; Males; *Mathematics Achievement; Mathematics Anxiety; Mathematics Education; *Parent Attitudes; Questionnaires; *Sex Differences; *Student Attitudes; Teacher Attitudes; Teaching Methods
IDENTIFIERS Ontario; *Single Sex Classes

ABSTRACT

Many students, and a particularly high proportion of females, do not study mathematics beyond minimum high school requirements. Research indicates that segregation of mathematics classes may help reduce the incidence of female students dropping out of that subject. To improve female students' attitudes toward mathematics and to increase the enrollment of females in upper level mathematics courses, students enrolled in grade 10 and 11 at A. Y. Jackson Secondary School were placed in sex-segregated math classes. This study focused on four main areas: attitudes, achievement, enrollment, and perceptions of the program. The longitudinal analysis of attitudes toward mathematics for students who were grade 11 in 1985-1986 provided some evidence that segregated classes had a beneficial effect on female students' attitudes. The analyses of data regarding student achievement and enrollment in mathematics are discussed. The majority of teachers thought that segregation created a more relaxed and open atmosphere. Comments made by parents reflected that attitudes and achievement were not affected by segregated classes, but that student ability or motivation and teacher's competence were important factors. Students surveyed felt more comfortable and relaxed and less intimidated in segregated classes. Appendices include student and parent questionnaires, interview materials, statistical tables, and responses to the questionnaires. (YP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED316419

RESEARCH REPORT

NORTH YORK
BOARD OF
EDUCATION

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Patricia Crawford

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

EFFECT OF SEX-SEGREGATED MATHEMATICS CLASSES ON STUDENT ATTITUDES, ACHIEVEMENT AND ENROLMENT IN MATHEMATICS:

A. Y. JACKSON SECONDARY SCHOOL

YEAR II

Sandra Sangster, Patricia Crawford

November, 1986

SE051250

BEST COPY AVAILABLE

TABLE OF CONTENTS

		Page
I	INTRODUCTION	1
	Background	1
	Purpose of Study	1
	Methodology	1
	Development of Questionnaires and Teacher Interview Schedule	3
	Participants	4
II	STUDENT ATTITUDES TOWARDS MATHEMATICS	
	Mathematics Attitudes Scales	6
	Cohort I	6
	Cohort II	11
	Student, Parent and Teacher Perceptions of Changes in Attitudes	15
	Career Aspirations of Students	17
	Student Participation Rates in Mathematics	20
III	STUDENT ACHIEVEMENT IN MATHEMATICS	23
	Analysis of Final Mathematics Marks	23
	Cohort I	24
	Cohort II	25
	Student, Parent and Teacher Perceptions of Changes in Achievement	25

		Page
IV	STUDENT, PARENT AND TEACHER REACTIONS TO SEX-SEGREGATED MATHEMATICS CLASSES	27
	Students	27
	Parents	31
	Teachers	33
V	CHANGES IN TEACHING STYLES AND STRATEGIES AS A RESULT OF SEX-SEGREGATED MATHEMATICS CLASSES	36
VI	TEACHERS' RECOMMENDATIONS FOR CHANGE	39
VII	SUMMARY	40
VIII	APPENDICES	
	A. Student Questionnaire	44
	B. Parent Questionnaire	52
	C. Teacher Interview Schedule	54
	D. Analysis of Attitude Scales - Cohort I Students	56
	E. Analysis of Attitude Scales - Cohort II Students	58
	F. Extent to which Career Aspirations of Students Involve a Knowledge of Mathematics	59
	G. Analysis of Final Mathematics Marks - Cohort I Students	60
	H. Analysis of Final Mathematics Marks and Achievement Test Scores - Cohort II Students	61
	I. Student Reactions of Sex-Segregated Mathematics Classes	62
	J. Parent Reactions to Sex-Segregated Mathematics Classes	65
	K. Plots of Cohort I Grade 10 and 11 Post-test Attitude Scores	69

INTRODUCTION

Background

As part of a pilot program designed to improve attitudes toward mathematics, and to increase participation rates in mathematics for females, students enrolled in grade 10 advanced math classes at A.Y. Jackson S.S. in 1984-85 were placed in sex-segregated math classes. All students in this group and a comparison group of grade 10 students attending another similar secondary school completed pre-post questionnaires assessing their attitudes towards mathematics. Students at both schools also completed the Mathematics Concepts and Applications sub-test of the Canadian Achievement Test (C.A.T.) at the end of the academic year. Year-end marks from grade 9 and 10 provided additional data on performance in mathematics. A report entitled "Effect of Sex-Segregated Mathematics Classes on Student Attitudes and Achievement in Mathematics: A.Y. Jackson S.S. Year I" provides detailed results for the first year of the program.

Purpose of Study

Educational Research and Evaluation Services was requested to continue the evaluation of the effects of segregated classes at A.Y. Jackson. As in Year I, four questions provided the focus for the study:

1. To what extent do sex-segregated classes change the participation rates of males and females in mathematics courses?

2. How are students' attitudes towards mathematics affected by segregated classes?

3. How is students' achievement in mathematics affected by segregated classes?

4. What are the reactions of students and teachers who are involved in the program, and of parents of newly placed grade 10 students towards sex-segregated classes?

Methodology

The program of segregating advanced mathematics classes at A.Y. Jackson was extended to grade 11 in the 1985-86 academic year. Thus, students who participated in Year I of the study (Cohort I) and who continued to enroll in advanced mathematics were again placed in sex-segregated classes. Because A.Y. Jackson became a semestered school in 1985-86, Cohort I students who completed their grade 11 advanced math credit in the first semester had the option of completing their grade 12 math credit in the second semester. These "fast-tracking" students contributed to the Year II data which was collected in the first semester but are no longer part of the study sample since grade 12 advanced mathematics courses were not segregated in 1985-86.

Further attrition of students from the Cohort I sample is attributable to students who were formerly enrolled in advanced math switching to the general math stream, either at the grade 11 or grade 12 level.

A second group of students who enrolled in grade 10 advanced mathematics in the 1985-86 academic year was also placed in sex-segregated classes. These students are referred to collectively as Cohort II. Cohort II students who completed their grade 10 math credit in the first semester had the option of completing their grade 11 advanced math credit in the second semester. Such students were placed in sex-segregated classes for both courses. A small number of these Cohort II students opted to switch to the general stream in the second semester and thus no longer form part of the sample for future data collection.

The study will be continued in the 1986-87 academic year so that the math enrolment of students in Cohorts I and II can be monitored. It is anticipated that the effects of the segregated classes will become more evident as students reach grades 12 and 13, where historically the sex difference in mathematics participation rates has been more pronounced. This report presents data collected during the second year of the evaluation.

In order to determine the extent to which possible changes in attitudes, achievement levels and participation rates at A.Y. Jackson are the result of segregated classes, data were collected from students at another North York secondary school. The comparison school used in Year I was employed again in Year II. The inclusion of this additional school provides a comparison group of students enrolled in non-segregated math classes who have also been assessed repeatedly on the same measures, and who are at the same grade level in a school with a similar socio-economic background and academic emphasis.

Data were collected by staff of Educational Research and Evaluation Services in co-operation with teaching staff from A.Y. Jackson and the comparison school. Data collection procedures in Year II involved the following:

. Cohort I

- Attitude questionnaires were administered to Cohort I students at A.Y. Jackson who were enrolled in grade 11 advanced math, and to all students enrolled in co-ed grade 11 math at the comparison school, just prior to the end of the course (either January or May, 1986).

- Year-end math marks were compiled for students enrolled in grade 11 advanced math at A.Y. Jackson and the comparison school. For students at both schools who also completed their grade 12 math credit, final grade 12 marks were also gathered.

. Cohort II

- Attitude questionnaires were administered to Cohort II students at A.Y. Jackson who were enrolled in grade 10 advanced math, and to all students enrolled in co-ed grade 10 math at the comparison school just prior to the end of the course (either January or May, 1986).

- The Mathematics Concepts and Applications sub-test of the Canadian Achievement Test (C.A.T.) Level 19, Form A was administered to all students in grade 10 advanced mathematics (Cohort II) at A.Y. Jackson and the comparison school at the same time as the attitude measure was administered.

- The grade 9 and 10 year-end mathematics marks (as reported by teachers) were collected for students enrolled in grade 10 advanced mathematics at A.Y. Jackson and the comparison school. The grade 11 marks of the sub-group of A.Y. Jackson students who opted to complete their grade 11 math credit in the same year were also gathered.

- A questionnaire was sent to parents of Cohort II students enrolled in grade 10 advanced mathematics at the end of their child's grade 10 math course (either February or June, 1986).

. Other Information

- Data were compiled regarding the 1985-86 enrolment by sex in mathematics courses at A.Y. Jackson and the comparison school.

- Teachers of the segregated classes at A.Y. Jackson were interviewed regarding their perceptions of the program's effects.

- Information was gathered regarding the teaching experience of math teachers at A.Y. Jackson and the comparison school.

This year the attitude questionnaire was not administered as a pre-test in September to grade 10 students (Cohort II), as was done last year for the Cohort I students, due to the time constraints imposed by semestering.

Development of Questionnaires and the Teacher Interview Schedule

The attitude questionnaire used in Year I was again used to assess important domain-specific attitudes which have been hypothesized to be related to the learning of mathematics. The scale consists of 51 items selected from the Fennema-Sherman Mathematics Attitudes Scales. High scores reflect positive attitudes towards mathematics. The scales which are derived from these items include the following:

- Attitude toward success in mathematics scale
- Mathematics as a male domain scale
- Mother scale
- Father scale
- Confidence in learning mathematics scale
- Mathematics anxiety scale
- Effectance motivation scale in mathematics
- Mathematics usefulness scale
- Teacher scale

Further details regarding the theoretical basis for these scales is provided in the literature review (Appendix A) of the report from Year I, with information regarding scoring of this measure found on pages 3 and 4 of last year's report.

As was the case last year, the attitude questionnaire also included a section which was designed to determine the extent to which students' prospective career choices involve a knowledge of mathematics. Students were asked to consider a list of careers varying in the amount of mathematics required, and to select the one which most closely resembled the career they would most like to have.

In a third section of the attitude questionnaire, students at A.Y. Jackson were asked to discuss the effects of sex-segregated classes and their reactions to them. Students at both schools were also asked whether or not they intended to continue enroling in advanced mathematics. A copy of the student attitude questionnaire may be found in Appendix A.

The questionnaire sent to parents of grade 10 advanced mathematics students at A.Y. Jackson was designed to determine their perceptions of the effectiveness of the sex-segregated classes and was the same as the one used in Year I. Questions were included regarding the classes' effect on their child's attitude and achievement in mathematics, as well as the importance they place on their child's mathematics education, and the extent to which they have become involved in her/his career planning. A copy of the questionnaire may be found in Appendix B.

Interviews were conducted with the teachers of grades 10 and 11 advanced mathematics at A.Y. Jackson in order to determine their perceptions of the effects of the segregated classes on students, as well as to gather information regarding any changes which may have occurred in their teaching styles and expectations. A copy of the interview schedule, which is similar to the one used last year, may be found in Appendix C.

Participants

The following tables provide information on the number of students involved in each part of the study.

Attitude Survey

	Grade 10 (Cohort II)			Grade 11 (Cohort I)		
School	Male	Female	Total	Male	Female	Total
A. Y. Jackson	171	161	332	159	152	311
Comparison School	110	146	256	135	135	269

Mathematics Achievement

		Cohort II			Cohort I
School		Gr. 9 mark	Gr. 10 mark	C.A.T.	Gr. 11 mark
A.Y. Jackson	Male	174	184	163	170
	Female	162	171	150	166
	Total	336	355	313	336
Comparison	Male	134	142	121	153
	Female	173	182	146	145
	Total	307	324	267	298

Twelve staff members (8 males, 4 females) at A.Y. Jackson who were teaching sex-segregated classes were interviewed regarding their perceptions of both female and male mathematics students and the segregated math program. Information was also gathered regarding the teaching experience of the staff members at A.Y. Jackson and the comparison school.

As the table below indicates, staff at A.Y. Jackson have been teaching on average two years longer than those at the comparison school. Their average teaching experience in mathematics and average number of years at their present school was also about two years longer at A.Y. Jackson. These data reverse the trend found in Year I of the study and are reflective of staff changes at both schools.

School	Average No. Years teaching	Average No. Years teaching math	Average No. Years at present school
A.Y. Jackson	15.2	10.1	6.1
Comparison school	13.1	8.1	4.1

Three hundred and seventy-seven questionnaires were sent to parents of students enrolled in grade 10 segregated classes. Responses were received from 158, a response rate of 42%. Seventy-eight percent of parents were aware that the classes had been segregated.

II. STUDENT ATTITUDES TOWARDS MATHEMATICS

1. Mathematics Attitudes Scales

Students were asked to indicate the extent to which they agreed or disagreed with a series of statements regarding their attitudes towards mathematics. Responses were assigned a score from one to six, with higher scores reflecting more positive attitudes.

An analysis of the data was carried out with the assistance of staff at the Institute for Social Research, York University. Average scores were calculated for each of the nine attitude scales and comparisons were made between the scores of males and females at each school as well as between the scores of students at A.Y. Jackson and the comparison school.

Cohort I

A multivariate analysis was carried out to examine the influence of sex and school on attitudes. The analysis included 256 students who completed the questionnaire at the end of grade 10 and grade 11, and who provided their names so that data from the two administrations could be matched. The sample can be broken down as follows:

School	Female	Male
A.Y. Jackson	63	65
Comparison School	63	65

It should be noted that in testing the influence of sex, school and time period on student attitudes, an overall test on all nine attitude scales combined was conducted first. Differences between males and females at the two schools and over time on the specific attitude scales were only examined if the overall tests were found to be statistically significant. Appendix D summarizes the overall tests of significance, as well as the signficance tests for the individual attitude scales.

On the tables that follow average scores are listed for each of the attitude scales. Where there are significant differences between scores (measured at the .05 level) these are discussed, otherwise it may be assumed that the scores are not significantly different. It should be noted that most scores are relatively high, thus indicating that the students generally hold very positive attitudes towards mathematics.

The average scores for the grade 10 and 11 post-tests are plotted separately for each of the attitude scales. These figures are provided in Appendix K.

a) Attitude Towards Success in Mathematics Scale

The Attitude Towards Success in Mathematics Scale was designed to measure the degree to which students anticipate positive or negative consequences as a result of success in mathematics. Students demonstrate a fear of success by anticipating negative consequences or by lack of acceptance or responsibility for the success, e.g. "It was just luck."

	Female		Male	
School	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	5.32	5.43	5.16	5.05
Comparison School	5.38	5.33	5.06	4.91

Females at both schools were significantly more likely than males to anticipate positive consequences as a result of success in mathematics. No differences were found between students at the two schools or between testings.

b) Mathematics as a Male Domain Scale

The Mathematics as a Male Domain Scale is intended to measure the degree to which students see mathematics as a male, neutral or female domain in the following ways:

- the relative ability of the sexes to perform in mathematics
- the masculinity/femininity of those who achieve well in mathematics
- the appropriateness of this line of study for the two sexes.

	Female		Male	
School	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	5.68	5.74	5.19	5.19
Comparison School	5.66	5.70	5.23	5.22

Females at both schools were significantly more likely to see mathematics as being equally suitable for men and women than were male students. These attitudes did not change over time at either school.

c) Mathematics Anxiety Scale

The Mathematics Anxiety Scale is intended to measure feelings of anxiety, dread, nervousness and associated bodily symptoms which are related to working on mathematics. The dimension ranges from distinct anxiety to feeling at ease.

	Female		Male	
School	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	4.41	4.42	4.23	4.10
Comparison School	4.16	3.99	4.50	4.14

Although students' level of anxiety had generally increased by the end of grade 11, this increase was significantly greater for both sexes at the comparison school than at A. Y. Jackson. There was virtually no change in the anxiety levels of females at A.Y. Jackson over time, such that by the time of the second post-test they expressed significantly more positive attitudes than students in the remaining groups.

d) Confidence in Learning Mathematics Scale

The Confidence in Learning Mathematics Scale is intended to measure confidence in one's ability to learn and to perform well on mathematical tasks. The dimension ranges from distinct lack of confidence to definite confidence.

	Female		Male	
School	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	4.91	4.86	4.85	4.71
Comparison School	4.63	4.46	4.99	4.58

Students of both sexes became less confident about their ability to learn math over time; this change was significantly greater for both sexes at the comparison school than at A. Y. Jackson. The confidence of female students at A.Y. Jackson showed virtually no change between grades 10 and 11. At grade 11, females at A.Y. Jackson were significantly more confident than females at the comparison school, but were not significantly more confident than males at either school.

e) Teacher Scale

The Teacher Scale was designed to measure students' perceptions of their teachers' attitudes towards them as learners of mathematics. It includes the teachers' interest, encouragement and confidence in the student's ability.

	Female		Male	
School	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	4.77	4.63	4.32	4.27
Comparison School	4.36	4.34	4.39	4.10

Females in general indicated that they felt their teachers had more positive attitudes towards them as learners of mathematics. Between grades 10 and 11, students perceptions of teachers' attitudes generally had become more negative. Examination of the means for grade 11 revealed that females at A.Y. Jackson expressed significantly more positive views than males at either school, and somewhat more positive views than females at the comparison school (borderline significance).

f) Mathematics Usefulness Scale

The Mathematics Usefulness Scale was designed to measure students' beliefs about the usefulness of mathematics currently and in relationship to their future educational, vocational and other activities.

School	Female		Male	
	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	5.25	4.94	5.14	4.77
Comparison School	5.03	4.94	5.04	4.69

There were no significant differences between schools or between males and females. However, perceptions of the usefulness of math declined over time for all students.

g) Effectance Motivation Scale in Mathematics

The Effectance Motivation Scale in Mathematics is intended to measure effectance as applied to mathematics. The dimension ranges from lack of involvement in mathematics to active enjoyment and seeking of challenge.

School	Female		Male	
	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	4.28	4.14	4.06	3.78
Comparison School	4.00	4.03	3.85	3.77

Females at both schools obtained significantly higher scores than males on this measure. By grade 11 students were generally less likely to indicate that they actively enjoyed and sought challenges in mathematics than they had been at grade 10 (with the exception of females at the comparison school).

h) Mother and Father Scales

The Mother and Father Scales were designed to measure students' perceptions of their mothers'/fathers' interest, encouragement and confidence in their ability. It also includes the students' perceptions of their mothers'/fathers' examples as individuals interested, confident and aware of the importance of mathematics.

Father Scale

School	Female		Male	
	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	5.33	5.26	5.30	5.16
Comparison School	5.17	4.98	5.12	4.87

Mother Scale

School	Female		Male	
	Grade 10	Grade 11	Grade 10	Grade 11
A. Y. Jackson	5.55	5.51	5.19	5.15
Comparison School	5.14	5.18	5.18	4.97

For the Father Scale, students did not differ as a function of either sex or school. All students expressed less positive views over time, although the change was quite small for females at A.Y. Jackson.

A different pattern of results was found for the Mother Scale. Females were more likely than males to express positive attitudes on this scale. This effect was largely due to differences between the sexes at A.Y. Jackson. Comparison of the grade 11 means indicated that females at A.Y. Jackson expressed significantly more positive attitudes on this scale than females at the comparison school and than males at either school.

i) Summary (Cohort I)

If segregated classes have a significant effect on student attitudes, differences in attitude scores would be expected between students at the two schools. These differences between schools might also be expected to vary over time and depend on the sex of the student. The longitudinal analyses comparing the grade 10 and 11 post-tests of Cohort I students provided some evidence that segregated classes have had a beneficial effect on female students' attitudes toward mathematics.

Increases in students' anxiety about math and decreases in their confidence about learning math which occurred between grades 10 and 11 were significantly greater at the comparision school than at A. Y. Jackson. More detailed examination indicated that virtually no change in confidence or anxiety occurred for females at A. Y. Jackson. At the end of grade 11, females at A.Y. Jackson were significantly less anxious about math than the remaining three groups of students. Females at A.Y. Jackson also expressed greater confidence in their ability to learn math than females at the comparison school by the end of grade 11. Although these attitudes become somewhat more negative over time for males at A. Y. Jackson, these changes were generally less than the changes observed for students at the comparison school.

Analysis of the grade 11 attitude scores on the Teacher and Mother Scales indicated that segregated classes have had additional benefits for females. Females at A. Y. Jackson felt that their teachers had significantly more positive attitudes towards them than did males at both schools and than females at the comparison school. A similar pattern of results was found with regard to students' perceptions of their mothers' interest and encouragement. Females at A.Y. Jackson expressed more positive attitudes than either females at the comparison school or males at both schools.

Cohort II

The second set of analyses examining differences between males and females at the two schools was based on Cohort II students who completed the post-test attitude measure in 1985-86 at the end of their grade 10 math course. The results of this analysis were also compared with the results found with grade 10 students in Year I of the study. The total sample size for the Cohort II analysis was 566. A more detailed breakdown of this sample is provided below:

School	Female	Male
A.Y. Jackson	155	160
Comparison School	144	107

In the overall tests of significance, males and females were found to have differing attitudes towards math. There were also some significant attitudinal differences between students at the two schools. However, the sex differences which were found were similar at A.Y. Jackson and the comparison school. Because it was not feasible to collect pre-test attitude data on the Cohort II students, the extent to which the groups differed initially is unknown. However, it is possible to compare the results found with this year's grade 10 students with those reported for the Year I grade 10 students.

On the tables that follow, average scores are listed for each of the attitude scales. Where there are significant differences (at the .05 level) these are discussed; otherwise it may be assumed that the scores are not significantly different. Appendix E summarizes the overall tests of significance, as well as the significance tests for the individual attitude scales.

a) Attitudes Towards Success in Mathematics

School	Female	Male
A. Y. Jackson	5.21	4.95
Comparison School	5.18	5.00

As was found in last year's post-test, female students at both schools were significantly more likely than males to anticipate positive consequences from success in mathematics. Students at the two schools did not differ significantly.

b) Mathematics as a Male Domain Scale

School	Female	Male
A.Y. Jackson	5.70	5.09
Comparison School	5.68	5.27

Females at both schools were significantly more likely than males to see math as being equally suitable for men and women, replicating last year's results. Students at the two schools did not differ significantly.

c) Mathematics Anxiety Scale

School	Female	Male
A.Y. Jackson	3.81	4.03
Comparison School	4.05	4.48

On average, females were significantly more anxious than males about math, although the sex differences were larger at the comparison school, and of borderline significance at A.Y. Jackson. Furthermore, students of both sexes at the comparison school expressed significantly less anxiety than students at A.Y. Jackson. This school effect was due to a greater extent to the differences found between males at the two schools. The differences in anxiety between females at the two schools were of marginal significance. No such effects were found for last year's grade 10 students.

d) Confidence in Learning Mathematics Scale

School	Female	Male
A.Y. Jackson	4.30	4.64
Comparison School	4.57	4.97

Males at both schools were significantly more confident than females in their abilities to learn math. Students at the comparison school expressed greater confidence than students at A.Y. Jackson. This school difference was significant for males but not for females. Similar sex differences were reported in Year I, although no differences between schools were found.

e) Teacher Scale

School	Female	Male
A.Y. Jackson	4.46	4.21
Comparison School	4.44	4.40

No differences were found between students at the two schools. There was a tendency (of borderline statistical significance) for females to believe that their teachers had more positive attitudes towards them as learners of mathematics which was largely due to differences between the sexes at A.Y. Jackson. No post-test school or sex differences were found in Year I, although on the pre-test measure females at both schools expressed more positive views than males.

f) Mathematics Usefulness Scale

School	Female	Male
A.Y. Jackson	4.87	4.93
Comparison School	4.97	5.30

Overall, males were significantly more likely than females to perceive math as useful, although this sex difference was only significant at the comparison school. Students at the comparison school were also more likely to believe math is useful than students at A.Y. Jackson. This effect was largely due to differences between males at A.Y. Jackson and the comparison school, since females at the two schools differed very little on this dimension. No significant school or sex differences were found in Year I.

g) Effectance Motivation Scale in Mathematics

School	Female	Male
A.Y. Jackson	3.90	3.99
Comparison School	3.96	4.12

As was the case in Year I, no significant school or sex differences were found for this scale.

h) Mother and Father Scales

Father Scale

School	Female	Male
A.Y. Jackson	4.92	5.07
Comparison School	4.91	5.21

Mother Scale

School	Female	Male
A.Y. Jackson	5.08	4.90
Comparison School	4.93	5.11

The only significant difference found on either scale was that males perceived that their fathers expressed more interest, encouragement and confidence in the student's ability than female's fathers did. This sex difference was significant at the comparison school, but not at A.Y. Jackson. No sex or school differences were found on either scale in Year I.

i) Summary (Cohort II)

Analysis of student responses indicated that there were some significant differences in the attitudes expressed by students at A.Y. Jackson and the comparison school. However, none of these differences provided evidence that segregated classes had a beneficial impact on the attitudes of Cohort II students at A.Y. Jackson. Because it was impossible to collect pre-test attitude data prior to students entry into the segregated math program, these results must be interpreted cautiously. The school differences which were found may reflect unmeasured pre-existing differences between these two samples of students. It is conceivable that students at the two schools were even more dissimilar in their attitudes prior to the program, and that segregated classes may have reduced, if not eliminated, these attitude differences.

Students at the comparison school expressed less anxiety and greater confidence about math than students at A.Y. Jackson, differences which were significant for males. For females, these school differences were in the same direction but were of marginal significance for the anxiety scale, and nonsignificant for the confidence scale. Males at the comparison school were also more likely to regard math as useful than males at A.Y. Jackson. Although this school difference was in the same direction for females, it was nonsignificant. Furthermore, there was a tendency for males at A.Y. Jackson to be less likely than females at the same school, and than students of either sex at the comparison school to believe that their teachers had positive attitudes towards them as learners of mathematics. No school differences in attitudes were found for students who were in grade 10 in 1984-85 (Cohort I). Data collected from Cohort II students in 1986-87 may help to clarify some of these results.

2. Student, Parent and Teacher Perceptions of Changes in Attitudes

Students

Students at A.Y. Jackson were asked near the end of their grade 10 or 11 mathematics courses whether they thought segregated classes had been effective in improving attitudes towards mathematics. Students who were enrolled in grade 11 math in Year II of the study made a similar assessment of the program's effects last year at the end of their grade 10 advanced mathematics course. Students' responses in Year II are summarized below. The responses of grade 10 students in the Year I post-test are provided in parentheses.

Students' Ratings of the Impact
of Segregated Classes on Attitudes

Grade	Sex	Yes %	No %	Don't know %	No Response %
10	M	26 (17)	50 (57)	24 (24)	- (3)
	F	43 (30)	34 (37)	22 (29)	1 (3)
	Total	34 (24)	42 (47)	23 (27)	0 (3)
11	M	18	62	20	-
	F	26	47	26	1
	Total	22	55	23	0

Grade 10 Chi square (2 d.f.) = 11.45 $p < .01$
Grade 11 Chi square (2 d.f.) = 7.05 $p < .05$

For the data collected in Year II, there was a significant relationship between sex of students and their views of the program's effects on mathematics attitudes at both grade levels. Males were less likely to agree that segregated classes had a positive effect on attitudes, and were more likely to state that such benefits had not occurred than would be expected if sex and perceptions of the program were unrelated. In contrast, females were more likely to agree that the program improved attitudes and were less likely to disagree than would be expected if sex and perceptions were unrelated. Although females expressed more favourable views than males, it should be noted that nearly half of the grade 11 females and about one third of the grade 10 females thought that segregated classes did not benefit students' attitudes toward mathematics.

Parents

Parents of grade 10 students were also asked if they felt that segregated classes were effective in improving students' attitudes towards mathematics. There was no significant difference between the parents of males or those of

females, although there was a tendency for the parents of boys to express greater scepticism about the possible benefits of the program on student attitudes. Their responses are summarized below, with the answers of parents of Year I grade 10 students provided in parentheses.

Parents' Ratings of the Impact of Segregated Classes on Attitudes

	Yes %	No %	Don't know %	No Response %
Parents of Males	21 (23)	44 (49)	34 (28)	1 (-)
Parents of Females	35 (33)	33 (36)	32 (29)	- (2)
Total sample	28 (28)	39 (43)	33 (28)	1 (1)

Chi square (2 d.f.) = 3.92 N.S.

Teachers

Teachers were also asked to discuss the effects that segregated classes have on student attitudes. Five of the eight male teachers indicated that the segregated mathematics program has had no noticeable impact on either students' attitudes or self confidence/expectations regarding math. One teacher thought that his male students benefitted in that they feel less shy and embarrassed about asking "dumb" questions and that students are more open with each other in segregated classes. Another commented that in both his female and male segregated classes, students appear to feel more comfortable than would be expected in a co-ed class.

The remaining male teacher responded that students' attitudes reflect societal views and continuing social pressures. Although segregated classes per se likely won't change these social pressures, they do provide female students with an opportunity to develop skills and abilities in math without having to fight negative attitudes and teasing from boys. The opportunity to develop math skills without hassles from the opposite sex is particularly important for students at this age because they are very concerned about self image and the opposite sex. Female students in mixed classes may simply give up on math if such hassles become too great. Thus, in his view, attitudes and self confidence may be influenced to some extent by segregated classes.

Three of the four female teachers indicated that the program has had a positive impact on female students' attitudes towards math. Female students feel more comfortable with math and with each other as a group, while some also feel more confident in their ability to do well in math. Students are less hesitant to ask questions and volunteer answers. Students also appear to feel a sense of freedom and relief because they don't have to be as self conscious about classroom performance. Even though some girls still feel they don't need math, they are generally willing to try the program because they know it was designed for them. The expectations of such students may eventually change in the view of one teacher.

Because the remaining female teacher was new to the school, she was unsure about the program's effects on attitudes. However, in her view, female students appear to enjoy their segregated math classes. This enjoyment may lead to a gradual improvement in students' self confidence regarding math. One of the female teachers who thought the program had a beneficial effect on students' attitudes was unsure whether the program has affected students' expectations of themselves or their self confidence. She has continued to see a number of female students surprised at their success in math who continue to attribute their success to factors other than their own efforts and abilities.

3. Career Aspirations of Students

Grade 10 and 11 students at both A.Y. Jackson and the comparison school were asked to select the career which most closely resembled the one they would like to have. A list of over 40 careers was provided, as well as a space where students could add any career not already included. For the purposes of analysis, the careers were grouped according to the amount of mathematics required.[1] The students' responses are presented in the tables that follow.[2] For comparison purposes, tables summarizing students' responses in Year I are provided in Appendix F.

For grade 11 students the level of mathematics required to pursue students' career choices was virtually identical for students of both sexes at A.Y. Jackson and for females at the comparison school. From 40 to 42 percent of these students selected careers for which grade 13 math is required. Another 22 to 26 percent selected careers for which grade 13 math is recommended. Thus, about 65% of these students selected careers for which grade 13 math was required or recommended. Males at the comparison school were more likely to aspire to careers for which grade 13 math was required (57%) or recommended (17%).

When the careers for which grade 13 math is either required or recommended are combined, the pattern of results in the Year II is generally similar to the post-test results reported for these students when they were in grade 10 (Year I). The most notable difference was that females in grade 11 at the comparison school were somewhat more likely to aspire to careers for which grade 13 math was required or recommended than they had been in the previous year (64% versus 56%).

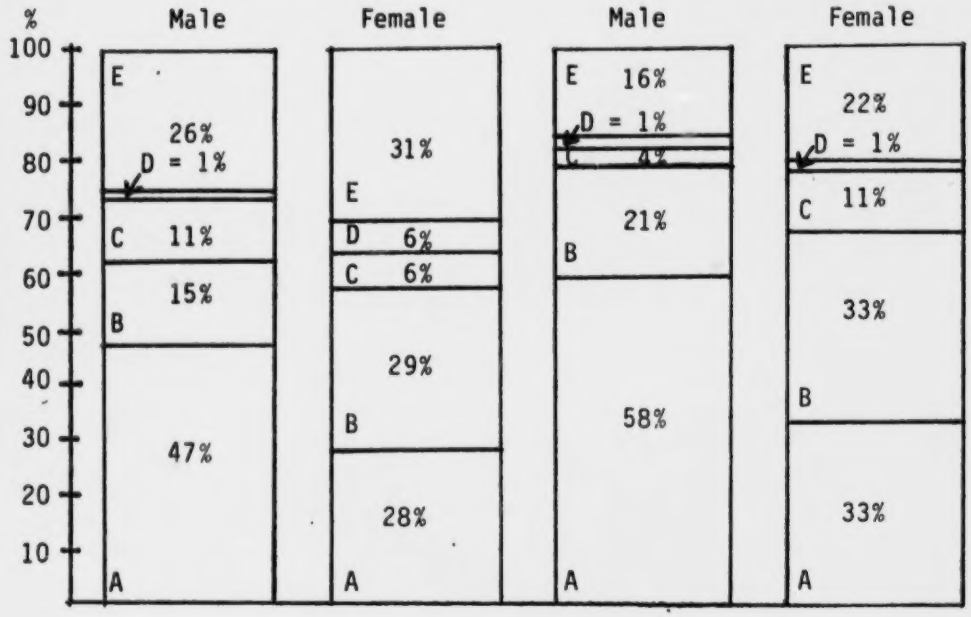
---

1. These groupings are based on information provided in Mathematics: The Invisible Filter, Toronto Board of Education, 1983, p. 33.

2. Percentages are based on the number of students who replied to that portion of the attitude questionnaire. The small number of students who listed several career choices were excluded from the analysis.

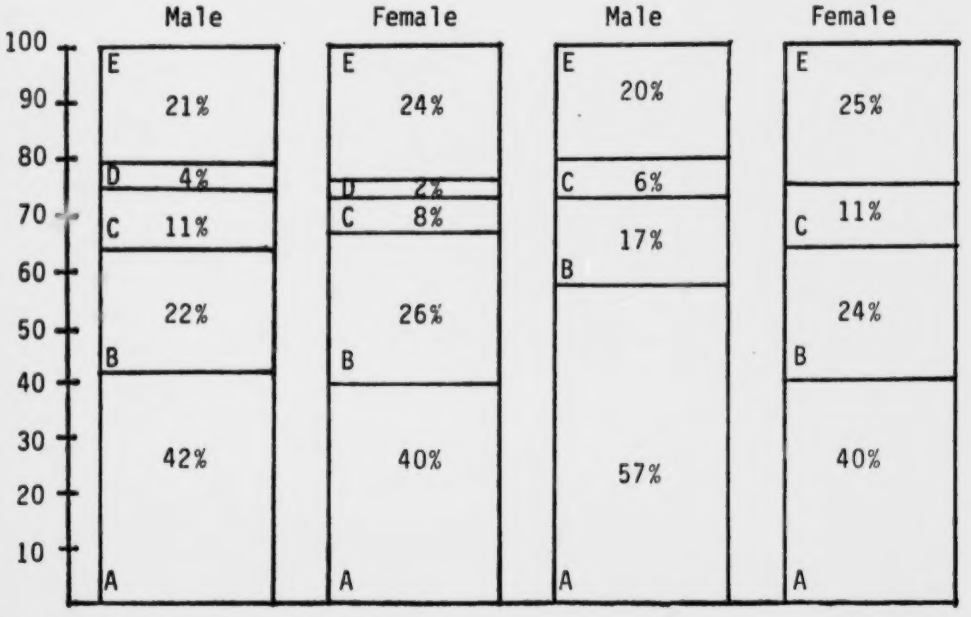
STUDENTS" CAREER ASPIRATIONS RELATED TO THE AMOUNT OF MATH REQUIRED

Grade 10



A. 13 Math required
B. 13 Math recommended
C. 12 Math required
D. 12 Math recommended
E. 11 Math or Less

Grade 11



A. 13 Math required
B. 13 Math recommended
C. 12 Math required
D. 12 Math recommended
E. 11 Math or Less

For grade 10 students in 1985-86 the level of mathematics required to pursue students' career aspirations was lower for females than for males at both A.Y. Jackson and the comparison school. Comparison of the two schools revealed that for both sexes, students' career aspirations required a higher level of math at the comparison school than at A.Y. Jackson. At A.Y. Jackson, 62% of males and 57% of females aspired to careers for which grade 13 math was either required or recommended. At the comparison school, such career aspirations were held by 79% of the males and 66% of the females.

Comparison of the career aspirations of grade 10 students in 1985-86 with those of grade 10 students in 1984-85 suggested that these student groups differed in extent to which they aspired to careers for which grade 13 math was either required or recommended. At A.Y. Jackson, both male and female grade 10 students were less likely to aspire to such careers than their counterparts had been in the previous year (62% versus 69% for males; 57% versus 64% for females). However, at the comparison school, both male and female grade 10 students were more likely than their counterparts in 1984-85 to aspire to careers for which grade 13 math was recommended or required (79% versus 71% for males; 66% versus 56% for females).

Because no pre-test information was collected in Year II, the possibility that Cohort II students at the two schools differed initially in terms of their career aspirations cannot be ruled out. Such initial differences might represent sampling fluctuation and be sufficient to account for the differences which were found in the career be aspirations of the two samples of grade 10 students. Information to be collected from these students in 1986-87 may help to clarify these findings.

The parents of grade 10 students at A.Y. Jackson were asked if they had discussed career possibilities with their children. An overwhelming majority (95%) of the parents of students of both sexes indicated that they had.

Parents were also asked to indicate how important it was for their child to study mathematics. Eighty percent of all parents indicated that it was "very important". Although the parents of males expressed this view somewhat more often than did the parents of females (83% versus 77%, respectively), this difference was substantially smaller than was reported for the parents surveyed in Year I (91% for parents of males versus 77% for parents of females). An additional twelve percent of the parents of both males and females thought that studying math was quite important. Four percent of males' parents and ten percent of females' parents thought that it was "somewhat" important. The differences between the opinions expressed by the parents of males and females were not statistically significant.

4. Student Participation Rates in Mathematics

In order to assess the effect that segregated classes have on student participation rates in mathematics, data were gathered regarding the current enrolment at all levels at both A.Y. Jackson and the comparison school. This information is summarized below. Comparable information which was collected in the 1984-85 academic year is provided in parentheses.

Male/Female Composition of Mathematics Courses 1985-86

	A.Y. Jackson		Comparison School	
General Level	Male %	Female %	Male %	Female %
Grade 10	48 (40)	52 (60)	38 (50)	62 (50)
Grade 11	44 (43)	56 (57)	58 (22)	42 (78)[3]
Grade 11 Computer Science	67 (67)	33 (33)	N.A.	N.A.
Grade 12	40 (45)	60 (55)	46 (48)	54 (52)
Total	44 (44)	56 (56)	45 (40)	55 (60)
Advanced/Enriched Levels				
Grade 10	53 (52)	47 (48)	48 (53)	52 (47)
Grade 11	53 (52)	47 (48)	54 (54)	46 (46)
Grade 11 Computer Science	77 (65)	23 (35)	65 (61)	35 (39)
Grade 12	53 (52)	47 (48)	55 (54)	45 (46)
Grade 12 Computer Science	78 (81)	22 (19)	81 (92)	19 (8)
Grade 13 Algebra	61 (81)	39 (19)	65 (75)	35 (25)
Grade 13 Calculus	49 (58)	51 (42)	58 (59)	42 (41)
Grade 13 Functions/Relations	54 (55)	46 (45)	58 (55)	42 (45)
Grade 13 Investment	65 (57)	35 (43)	N.A.	N.A.
Total	55 (56)	45 (44)	55 (55)	45 (45)
TOTAL	54 (54)	46 (46)	55 (56)	45 (44)

For general level courses, there have been relatively few changes in enrolment patterns for males and females between Years I and II. Enrolments at the two schools are still quite comparable, with one exception which is footnoted.

---

3. Although there has been a substantial change in the proportion of males and females enrolled in grade 11 general math, these percentages are based on a small number of students (Year I - 5 males, 18 females; Year II - 11 males; 8 females). Thus the percentage difference between Years I and II may represent chance fluctuation.

For grades 10, 11 and 12 advanced and enriched level mathematics, as well as grade 13 functions/relations, there have been minimal changes over time in the proportions of males and females enrolled at both A.Y. Jackson and the comparison school. Furthermore, the proportions of males and females enrolled in these courses is still quite similar at the two schools.

An increase in the proportion of females was noted for both grade 13 algebra and calculus courses at A.Y. Jackson although there was also an increase in the proportion of females enrolled in algebra at the comparison school. Statistical analyses indicates that at A.Y. Jackson the 20% increase in class composition between Years I and II to 39% female was a significant one. The 10% increase to 35% female at the comparison school was not significant.

Although the two schools had virtually the same proportion of females enrolled in calculus in Year I, 51% of the students enrolled in calculus at A.Y. Jackson were female in Year II representing a 9% increase. This increase was of borderline significance ($p < .10$). No change in female enrolment in calculus was noted in Year II at the comparison school.

The increases in female students' enrolment in grade 13 algebra and calculus courses may represent a "spill-over" effect of the segregated mathematics program to students who themselves had not participated in the program. It is likely that the issue of female participation rates in higher level math courses has gradually assumed a higher profile among students in the school. One female teacher indicated that she made a point of discussing this issue with female students at the time of registration for the 1985-86 academic year. The extent to which other outside factors may have had an influence on enrolments cannot be determined from the information available.

Students at both A.Y. Jackson and the comparison school were asked if they planned to take mathematics the following year, and if yes, at what level. Students' responses are summarized below for both grade levels.

Students' Plans to Continue Enroling in Mathematics

	A.Y. Jackson					Comparison School				
	Yes			No	N.R.	Yes			No	N.R.
Grade 10	Adv. %	Gen. %	N.R %	%	%	Adv. %	Gen. %	N.R. %	%	%
Female	89	6	3	2	1	92	2	1	1	3
Male	95	2	1	-	2	98	-	-	-	2
Total	92	4	2	1	2	95	1	1	-	3

Grade 11	A.Y. Jackson					Comparison School				
	Yes			No	N.R.	Yes			No	N.R.
	Adv. %	Gen. %	N.R %	%	%	Adv. %	Gen. %	N.R. %	%	%
Female	93	1	3	1	1	90	1	-	5	3
Male	94	1	1	3	2	91	1	1	1	6
Total	93	1	2	2	2	91	1	-	3	4

The vast majority of students of both sexes at both grade levels stated their intention to continue to enrol in advanced mathematics. Based on responses to this question which were summarized in the Year I report, the male/female composition of grade 11 advanced mathematics at A.Y. Jackson was expected to be 51:49 and 50:50 at the comparison school in 1985-86. The actual male/female composition found for this course in 1985-86 was 53:47 at A.Y. Jackson and 54:46 at the comparison school - proportions very similar to those found in the previous year. Thus, slightly fewer girls actually took math in grade 11 than said they were going to.

III. STUDENT ACHIEVEMENT IN MATHEMATICS

1. Analysis of Final Mathematics Marks

In order to examine the impact of both segregated classes and sex on student achievement, final mathematics marks were collected for students at both A.Y. Jackson and the comparison school. Two separate sets of analyses were conducted on these marks.

The first was a longitudinal analysis of the final math marks of Cohort I students, beginning with their grade 9 marks (prior to the implementation of the segregated math program) and including their marks in grades 10 and 11. The purpose of this analysis was to determine whether there were significant differences between the sexes, between schools or significant changes in marks over time that were linked to sex or school. The sample of students included in this analysis was limited to the sub-group of students in grade 11 math in 1985-86 for whom grade 9 and 10 marks were also available. The total sample of 412 is described below:

	A.Y. Jackson	Comparison School
Female	114	84
Male	127	87

The second was a longitudinal analysis of the final math marks of Cohort II students, beginning with their grade 9 marks and ending with their final grade 10 marks (representing one year in the segregated math program for students at A.Y. Jackson). This analysis was also designed to determine whether there were significant differences between the sexes, between schools or changes over time. In addition, it provided a basis for comparison with the results obtained for grade 10 students in Year I. The total sample of 643 can be broken down as follows:

	A.Y. Jackson	Comparison School
Female	162	173
Male	174	134

In order to determine whether differences in grades for the Cohort II students might be attributable to differences in marking schemes between the two schools, a C.A.T. mathematics sub-test was administered to grade 10 students at both schools at the end of students' grade 10 math course (as was done in Year I for the Cohort I students). The total sample of 580 was somewhat smaller than for the analysis of final marks because of absenteeism for the test session. The sample for this analysis is described below:

	A.Y. Jackson	Comparison School
Female	150	146
Male	163	121

Detailed statistical summaries of these analyses may be found in Appendices G and H for Cohorts I and II, respectively.

Cohort I

Because the longitudinal analysis of Cohort I students' final marks includes a subset of those students included in the Year I analysis, the average grade 9 and 10 marks reported here differ somewhat from those previously reported in the Year I. Average grade 9, 10 and 11 final math marks for males and females at both schools are summarized below:

Average Mathematics Mark (%)

	Grade 9		Grade 10		Grade 11	
	A.Y.J.	Comparison	A.Y.J.	Comparison	A.Y.J.	Comparison
Female	71	71	69	74	69	69
Male	68	68	64	72	63	68

Overall, females received significantly higher final marks than males. These differences were evident at both schools and all grades, although the sex difference in grade 11 at the comparison school was negligible.

Significant differences were found between schools, with students at the comparison school tending to receive higher final marks. This is largely due to differences between schools at the grade 10 level.

As can be seen from the table, there were no differences between schools for the grade 9 marks of either males or females. For students at the comparison school, the final marks of both sexes improved in grade 10; at A.Y. Jackson marks in grade 10 declined - most noticeably for males. The final grade 11 marks of both males and females at A.Y. Jackson were similar to their grade 10 marks (with females continuing to receive higher grades than males). By grade 11, the marks of students of both sexes at the comparison school had declined and were approximately the same as for grade 11 females at A.Y. Jackson. Grade 11 males at A.Y. Jackson had lower marks than the remaining groups of grade 11 students. There were no differences between groups in Year I on a standardized math achievement test which could account for the lower final marks of males at A.Y. Jackson.

Cohort II

Average grade 9 and 10 math marks for males and females in Cohort II at both schools are summarized below:

Average Mathematics Mark (%)

	Grade 9		Grade 10	
	A.Y.J.	Comparison	A.Y.J.	Comparison
Female	69	71	64	68
Male	69	69	64	67

No significant sex differences were found for students at either school or at either grade level. There were significant declines in final marks between grades 9 and 10, as well as differences in average marks at the two schools. At grade 9, the marks of both males and females at the two schools were quite similar. By grade 10, all students' marks were lower but the decline was larger at A.Y. Jackson than at the comparison school.

A comparison of results for Cohorts I and II shows that in the Cohort II sample, the schools differed only in the extent of the decline in marks, not in the direction of the changes which occurred. Furthermore, Cohort II males at A.Y. Jackson showed no greater decline in marks than females at that school, with the marks of all grade 10 A.Y. Jackson students being the same as was found for the Cohort I sample of grade 10 males at A.Y. Jackson.

The analysis of the grade 10 marks for Cohort II suggests the possibility that students at A.Y. Jackson are achieving at lower levels than students at the comparison school. Analysis of the Canadian Achievement Test math sub-test indicated that students at the comparison school received significantly higher achievement scores, although this effect appeared to be due largely to the difference between males at the two schools since the difference for females was quite small. The sex differences in C.A.T. scores were not sufficient to affect marks since no sex differences in final math marks were found.

	A.Y. Jackson	Comparison School
Female	29.1	29.5
Male	30.1	31.7

2. Student, Parent and Teacher Perceptions of Changes in Achievement

On the attitude questionnaire, which was administered near the end of students' grade 10 or 11 mathematics courses, students at A.Y. Jackson were asked if they thought segregated classes had been effective in improving achievement in mathematics. Students' responses in Year II are summarized below, with the answers provided by grade 10 students in the Year I post-test summarized in parentheses.

Students' Ratings of the Impact of
Segregated Classes on Achievement

Grade	Sex	Yes %		No %		Don't know %		No Response %	
10	M	29	(20)	48	(50)	23	(26)	-	(4)
	F	39	(29)	38	(42)	20	(25)	3	(4)
	Total	34	(24)	43	(46)	21	(26)	2	(4)
11	M	26		55		18		1	
	F	29		42		26		3	
	Total	27		49		22		2	

Grade 10 Chi square (2 d.f.) = 4.59 N.S.
Grade 11 Chi square (2 d.f.) = 5.33 N.S.

Approximately one-third of this year's grade 10 students and 27 percent of the grade 11 students felt that the segregated math classes had improved their achievement in mathematics. There was no evidence that students' views regarding the program's impact on achievement levels were significantly related to sex, at either the grade 10 or 11 level, despite a tendency for males to be less positive than females.

Parents of grade 10 students were also asked if they felt that segregated classes were effective in improving students' achievement in mathematics. The parents of sons and the parents of daughters did not differ significantly in their opinions regarding the program's effects on their child's achievement levels. The responses of parents of grade 10 students in Year I are provided in parentheses.

Parents' Ratings of the Impact of
Segregated Classes on Achievement

	Yes %	No %	Don't know %	No Response %
Parents of Males	23 (33)	47 (51)	29 (16)	1 (-)
Parents of Females	30 (29)	32 (45)	36 (24)	1 (2)
Total sample	27 (31)	39 (48)	32 (20)	1 (1)

Chi square (2 d.f.) = 3.61 N.S.

Teachers' views regarding the impact of segregated classes on student achievement in math were also solicited. Ten of the twelve teachers at A.Y. Jackson indicated that either there had been no noticeable change or that they didn't know if there had been a change because they were new to the school or because they had not had the same students in a co-ed class to provide a good basis for comparison. Of the remaining staff, one female teacher responded that some students seemed to be achieving at a higher level. In contrast, one male teacher thought that male students tended to get less work done in an all male class because of poor concentration.

IV. STUDENT, PARENT AND TEACHER REACTIONS TO SEX-SEGREGATED MATHEMATICS CLASSES

1. Students

Students at A.Y. Jackson were asked to discuss the effectiveness of segregated classes in improving attitudes toward and achievement in mathematics. The most commonly made responses to these two questions are summarized below.

Positive Comments	Attitudes				Achievement			
	Gr. 10		Gr. 11		Gr. 10		Gr. 11	
	M %	F %	M %	F %	M %	F %	M %	F %
. students feel more comfortable, relaxed and less intimidated in segregated classes - less peer pressure, embarrassment, shyness, tension - easier to participate (ask and answer questions) and improve grades - classes more enjoyable - students feel more equal	6	22	6	16	7	17	5	12
. fewer distractions, easier to concentrate on work and pay attention - easier to relate to a teacher of the same sex - easier to work with and understand students of the same sex	12	13	7	4	10	9	8	7
. segregated classes help girls realize math is important and teachers care about their success - girls feel better about math and are less likely to think boys are smarter in math - both sexes will try harder to do well	-	4	-	6	1	4	1	2
. segregated classes have been generally helpful; math marks have improved	2	2	1	1	2	5	1	5
. segregated classes are easier to control - all girls class is better because boys clown too much (female respondents) - all boys class is better because girls complain too much (male respondents)	2	1	1	1	1	-	2	-

	Attitudes				Achievement			
	Gr. 10		Gr. 11		Gr. 10		Gr. 11	
	M %	F %	M %	F %	M %	F %	M %	F %
Positive Comments (Continued)								
. segregated classes are beneficial because boys and girls have different ways of solving math problems and types of difficulties in math	1	1	1	-	1	-	-	-
Negative Comments								
. segregated classes are unnecessary, a bad idea and can reinforce, in both sexes, the idea that boys are better in math - insulting to students' intelligence - may make students resent math - students feel like guinea pigs - students may develop hardened attitudes to the system	3	4	6	11	1	1	3	1
. students have to learn to work with both sexes in the outside world	7	1	3	1	2	1	2	1
. segregated classes are noisier, more unruly	5	2	3	2	1	1	1	3
. segregated classes are boring, dull, less enjoyable	5	2	5	-	2	-	1	-
. segregated classes are less challenging and competitive; students don't work as hard without the opposite sex to impress	2	4	1	2	5	2	3	3
. marks have worsened this year	2	-	2	2	4	2	1	2
Neutral Comments								
. attitudes and achievement are not affected by segregated classes - they depend on other factors such as student motivation or ability, whether students like math or the teacher's skill	23	26	28	35	21	28	22	34
. the effect of segregated classes depends on the individual - some have found them helpful; for others the classes have made no difference	4	9	8	8	4	8	4	11

	Attitudes				Achievement			
	Gr. 10		Gr. 11		Gr. 10		Gr. 11	
	M %	F %	M %	F %	M %	F %	M %	F %
Neutral Comments (Continued)								
. haven't given segregated classes much thought or have no basis for comparison - too soon to tell - new to school or to program	5	2	3	1	9	4	3	4
. effects of the program may depend on the sex of the student - program may benefit girls but boys may stay the same or do worse in math	1	1	-	1	-	-	1	1
No Response	20	12	28	13	33	19	40	22

Students at A.Y. Jackson were also asked to provide a general assessment of whether participation in sex-segregated classes had been a positive experience for them. Their responses are summarized below:

Students' Ratings of Their Experience in Segregated Classes[4]

Grade	Sex	Yes %	No %	Don't know %	No Response %
10	M	23	47	30	1
	F	50	17	32	-
	Total	36	33	31	1
11	M	19	43	38	-
	F	38	28	33	1
	Total	28	36	35	1

Grade 10 Chi Square (2 d.f.) = 39.53 $P < .01$
Grade 11 Chi Square (2 d.f.) = 16.14 $P < .01$

4 Because this question was asked in an open-ended format in Year I, no comparable data summarizing the responses of grade 10 students last year is available.

There was a significant relationship found between sex of students and their views regarding how positive an experience sex-segregated classes had been. Females were much more likely to say the experience was positive and less likely to say it had been negative than would be expected. In contrast, males were less likely to say that the experience had been positive and much more likely to say it had been negative than would be expected if sex were unrelated to student opinions. About 45 percent of males did not regard the experience as positive, compared with approximately 22 percent of females at both grade levels.

For the most part, their comments about their experiences in the program fell into categories similar to those summarizing responses to the questions about the program's effects on attitudes and achievement. Students' responses about the nature of their experiences, positive or negative, are summarized in Appendix I.

Students were also given the opportunity to make any other comments they felt were appropriate regarding sex-segregated mathematics classes. Only twenty-eight percent of female grade 10 students did so, whereas about 44 percent of the remaining students took advantage of this opportunity. Students' comments are summarized below, with the number of students on which the percentages are based listed listed in parentheses.

	Gr. 10		Gr. 11	
	M (72) %	F (45) %	M (69) %	F (73) %
. segregated classes are ineffective, unnecessary - should revert to co-ed classes - hopes other classes won't be segregated - at this age students should be mature enough not to need segregation	11	3	11	8
. segregated classes are a good idea and are beneficial for various reasons (improve concentration; more relaxed; easier to participate)	2	9	4	9
. strong criticism of segregated classes offered - students are totally opposed; feel like guinea pigs - segregated classes are "pathetic", "stupid", "weird", "unnecessary!!"	8	2	9	2
. segregation probably makes little or no difference and is overshadowed by other factors, like ability motivation	5	3	4	7
. segregated classes are sexist, discriminatory, unconstitutional - may make girls feel inferior or make it harder to adjust to co-ed math classes at university - students must learn to work with the opposite sex	2	3	2	8
. segregated classes may help some students, but may not be necessary for others	-	1	1	5

	Gr. 10 M %	Gr. 10 F %	Gr. 11 M %	Gr. 11 F %
. segregated classes should become optional	2	3	1	1
. segregated classes are "a good experiment"; "a nice try" - there is no real disadvantage to segregation - if it works it should be continued - program should be evaluated for a reasonable time period - either type of class is okay	2	1	1	3
. segregated classes are a bad idea because they lessen competition and rivalry - students won't try as hard if they don't have the opposite sex to impress - girls are just as ambitious as boys	2	1	2	2
. sex segregation is a bad idea because classes are dull, less enjoyable, less interesting or are too noisy	2	4	1	-
. reasons behind segregated classes are questioned - questions the equivalence of the male and female segregated classes - questions whether program works - questions whether it is necessary for most students	2	1	1	2
. classes should be segregated on the basis of ability not sex	1	-	3	-
. the Board should investigate other educational problems, such as the effect of teachers and teachers qualifications	1	1	1	1
. student would have attended a private school if he/she wanted segregated classes	1	-	2	1
. other classes should be segregated	1	-	-	1
. other miscellaneous responses	2	1	3	3
No Response	58	72	57	52

2. Parents

The parents of students in grade 10 segregated classes at A. Y. Jackson were asked to comment on the classes' effectiveness in improving their children's attitudes and achievement in mathematics. They were also given the opportunity to make any other comments they felt were appropriate regarding segregated classes. A complete listing of responses and percentages is found in Appendix J.

The most commonly cited positive features of the sex-segregated mathematics classes included:

- less hesitancy on the part of students to express difficulties, seek help and answer questions; segregated classes are less pressured and more relaxed and enjoyable
- without the opposite sex, concentration on math is improved and there are fewer distractions
- in segregated classes, students are more confident and feel better about math
- achievement in math has improved

A number of parents were critical of the sex-segregated program and its effects. The most frequently cited concerns included the following:

- segregated classes are unnecessary, useless; such classes may benefit girls at the expense of boys
- segregated classes imply that females are not as good in math as males; girls may feel more insecure and that they are seen as "inferior" to boys
- achievement in math has declined
- segregated classes are noisier, more difficult to control

A number of other comments which could be classified as neutral were made by some parents:

- attitudes and/or achievement are not likely affected by sex-segregation but may be affected by other factors such as student ability or motivation, teacher competence, class size or semestering
- it's too soon to tell; haven't thought about it; nothing is lost by trying it out; it's a worthwhile experiment
- question what evidence there is to support the idea of sex-segregation; would be interested in seeing the results of the study; to prove the program has merit, a control group is needed.

Parents were also asked if, in general, segregated classes had been a positive experience for their children. The opinions of parents were significantly related to the sex of the child. The parents of girls were twice as likely as the parents of boys to say the classes had been a positive experience. Furthermore, parents of boys were more likely to say they didn't know or that the experience had not been positive, while the parents of girls were less likely to express such views. Parents' responses are summarized below with the responses of parents in Year I provided in parentheses.

Parents' Ratings of their Children's Experiences in Segregated Classes

	Yes %	No %	Don't know %	No Response %
Parents of Males	21 (26)	42 (42)	35 (28)	3 (4)
Parents of Females	43 (32)	32 (27)	21 (29)	4 (12)
Total sample	32 (29)	37 (35)	28 (28)	3 (8)

Chi Square (2 d.f.) = 9.92 $p < .01$

3. Teachers

The teachers of the segregated classes at A. Y. Jackson were asked to discuss the overall effectiveness of the program. There were some differences between male and female teachers in the degree of support for the concept behind the program. All four female teachers expressed the view that the program has been very worthwhile, although the one female teacher who had been assigned as a replacement to an all male class expressed some reservations about the effects of the program on male students. All female teachers feel that the program has provided a very positive experience for both themselves and their female students. The positive effects of the program which were mentioned included the following:

- the classroom atmosphere is more relaxed and open, with a greater sense of comraderie
- female teachers provide appropriate role models for their female students
- female students have at least one class a day in which they can really extend themselves, with a built in support network to do well in mathematics
- increases female students' awareness that they can do well in math

Of the male teachers, three also feel that the program has been worthwhile (one of these teachers had taught both male and female segregated classes). Another felt it was worthwhile initially but is reserving judgement until the final grade 13 enrolment data is available. These teachers indicated that the program has been a positive experience for them as teachers. In their view, segregated classes have been, at worst, a neutral experience for their male students and, at best, a positive experience for some or all of their students once students have gone through an initial adjustment period. Benefits cited by these male teachers included:

- a broadened perspective on issues related to sex bias
- greater awareness of the difficulties students encounter in math
- greater ease in marketing math to students' interests when only one sex is involved

Two male teachers were unsure of the program's merits, one because he is new to the school. The remaining two male teachers do not feel that the program has been worthwhile, with one of them stating that segregated math classes have definitely not been a positive experience either for himself or his students. This teacher emphasized the importance to adolescent development of socialization with the opposite sex, and the value of working in co-ed groups to increase understanding of the thinking styles of the opposite sex. The remaining three male teachers generally regard the program as a neutral experience both for them as teachers and for their students.

Their comments included:

- students haven't complained much so it has not been a big issue
- some students failed to notice that they were in all male class
- the program was designed to benefit girls and no particular benefits are to be expected for boys
- it certainly has not been a negative experience, but it is harder to demonstrate that it has been positive for male students

Teachers were also asked whether they thought the segregated math program should be continued. Three of the female teachers felt that segregated classes should be continued. The remaining female teacher indicated that segregation of the sexes probably makes no difference for good students but should perhaps be offered on an optional basis.

Despite the previously discussed concerns of some of the male teaching staff, six male teachers indicated that segregated classes should be continued until sufficient data is available to permit a fair evaluation of the program. The view was expressed that there is nothing to lose by giving the program such a trial. Opinions differed somewhat regarding the length of time needed to permit such an evaluation, ranging from the end of Cohort I's grade 12 year to five years after the program's implementation. Two male teachers do not feel that there are any educational grounds for continuing the program. Of these, one felt it could be made optional, whereas, the second expressed willingness to continue the program on a trial basis to permit a full evaluation.

Teachers were also given an opportunity to make additional comments they felt were appropriate regarding the segregated math program. These are summarized below.

	# Teachers
• societal changes have been occurring slowly and will continue leading to gradual changes in attitudes and reductions in stereotyping	6
- segregated classes may boost awareness of the issues but societal changes must still occur	
- equal pay legislation and the increasing work force participation of women is having an impact on attitudes	

	# Teachers
- pressure to take math is increasing; females will take math if it is a prerequisite	
- there is still a "Cinderella Syndrome" in which girls behave as though they don't need a career and thus don't need math, even though they may deny that they think this way	
. more female teachers are needed in math and sciences	3
- to a considerable degree students' attitudes depend on their teachers	
- teachers must do all they can to encourage females to stay in math and to take enriched math if their marks warrant it	
. the program is doing some of the right things day-by-day but other powerful factors can run counter to the program's objectives (e.g. parental attitudes)	2
. the enrolment imbalance is even greater in other subject areas (e.g. computer science) than it is in math	1
. in English and languages, more females than males are enrolled; sex-segregation is not a solution to all such imbalances	1
. segregated classes tell females that they can achieve in math and increases their awareness of course and career alternatives	1
. the effects of segregation on female students when they return to competitive mixed-sex world may not be positive	1
. it could be argued that segregation should be based on ability not sex, since poor students may be easily intimidated by those of higher ability	1
. it may not be necessary to segregate grade 12 students because they are more mature and are generally all concerned enough about marks to want to do well	1
. females may have been discriminated against in the past but this is no longer true	1
- if you deny that there are basic biological differences then you must accept the untenable position that there must be an equal number of both sexes in all courses	

V. CHANGES IN TEACHING STYLES AND STRATEGIES AS A RESULT OF SEX-SEGREGATED MATHEMATICS CLASSES

Teachers were asked to comment on any differences in students' classroom behaviour which they thought resulted from placement in sex-segregated classes. They were also asked to discuss any changes which had been brought about in their teaching styles and strategies as a result of the segregated mathematics program.

There was some consensus among five of the male teachers, and the one female teacher who had been assigned to a male class, that the behaviour of students in all male classes tends to be noisier and more immature than it is in co-ed classes, particularly at the grade 10 level. Boys are more likely to be shy if girls are present and are thus likely to be better behaved and less outspoken.

Teachers were generally reluctant to attribute these difficulties solely to segregated classes, since the mix of personalities in a class can also have a great effect on the classroom atmosphere. The female teacher who agreed with these concerns regarding classroom behaviour indicated that some of her more serious male students wished they were back in a co-ed class so that there would be "a better attitude toward learning and a less disrupted atmosphere in the classroom". The remaining three male teachers either did not have similar experiences with their male classes or did not think that sex-segregation was responsible for behavioural differences.

That the mix of students in a class may have a stronger effect on teaching styles than the students' sex was illustrated by the comments of a male teacher who had both a male and a female segregated class. Because the boys' class was very weak in math, he found that an "ultra-sympathetic" style was necessary. In contrast, students in his female class were very strong in math, and thus he taught them in a fairly aggressive style. These female students initially were not putting any pressure on themselves. He consciously exerted pressure on them to which they responded positively. He challenged their needless worry and complaints about their performance on tests by informing them that their class consistently had the highest math marks in the school. He tried to instill in these students a sense of pride in their math achievement, while at the same time emphasizing the importance of math. Despite the very high achievement levels of two of these female students, he was unsuccessful in convincing them to take part in math contests. He commented on how difficult it is to overcome some of the external factors which may discourage females from pursuing mathematics (e.g. lack of support from parents).

Female teachers indicated that girls in segregated classes are more likely to participate in class activities. In co-ed classes, girls tend to be more reticent and more likely to let males take responsibility for answering and asking questions. Furthermore, girls in co-ed classes may also be more likely than boys to lack confidence and to give up in the face of teasing from the opposite sex, as was also noted by some of the male teaching staff. As with the male students, some female students are more talkative in segregated classes. However, in the view of the female teaching staff the general

atmosphere of female segregated classes tends to be more relaxed, with there being a greater sense of comraderie among students and a greater involvement of students in helping each other.

Teachers' observations regarding differences in the behaviour of male and female students in mixed versus segregated classes are relevant to some of the changes they've implemented in their teaching styles and strategies, despite the fact that most teachers do not feel that their styles have changed that dramatically. What changes they have noted are summarized below.

Five male teachers indicated that their teaching style has not changed substantially. Of these five teachers, the one who had both male and female segregated classes commented that he consciously tried not to make his style different. The remaining three male teachers noted some stylistic changes. For two of them, these changes primarily involve the use of different types of humour or topics of conversation "to break the ice" with students. Greater attention to the management of students' classroom behaviour was also explicitly mentioned by two of these male teachers, as well as by the one female teacher who taught a male segregated class.

In addition to classroom management issues, one of these five male teachers indicated that in male segregated classes he tends to be somewhat harsher in his reprimands. In his view, this stylistic difference probably reflects his own personal bias about sex differences in how well students cope with criticism. Another male teacher who indicated that his teaching style hasn't really changed also commented that he tends to be rougher with male students.

No major changes in teaching styles were noted by female teaching staff as a result of the segregated math program. One teacher felt that this lack of change may be "a bit of a loss" for her female students in view of the possibility that boys and girls may differ somewhat in their learning styles. However, because she herself is a product of an educational system that is geared to males, her teaching style necessarily reflects that background.

Female teachers indicated that they try to point out to students in both co-ed and segregated classes, situations that are structured in ways that discourage girls from excelling. In their view, teachers have to be very careful in their remarks to students because it is easy to unintentionally communicate negative views to female students. Some girls seem to accept these views even though their marks may be excellent. In segregated classes, teachers can have higher expectations of their female students and the fine line between encouragement and pressure to answer questions is less of an issue. These teachers also mentioned the importance of making up examples and test questions which include female characters in settings to which female students can relate. This was also a strategy which was explicitly mentioned by two of the male teaching staff.

Female teachers mentioned efforts to make their female students feel as involved and comfortable in class as possible. These teachers also commented that they themselves felt more relaxed and freer to discuss relevant issues by providing examples based on their own personal experiences. However, one teacher commented on the great amount of energy which is required

to counteract the reluctance of some female students to continue in math. At last year's fall registration, she made a point of telling girls that the sex of the student, much more so than marks, determines which and how many mathematics courses students take in grade 13. Many girls explained this away by saying that females aren't as interested in math, illustrating that there are still female students who have accepted this viewpoint as a given.

In general terms, there has been an increased awareness on the part of teaching staff of the particular needs of male and female students which has helped teachers to better meet those needs. A couple of teachers also commented on the undercurrent of stereotyped attitudes which still surfaces from time to time in students of both sexes and which may reflect external influences over which teachers have no control. Considerable effort is required to combat these attitudes. Female teachers generally feel that it is important that girls have role models available to them who have demonstrated that it is possible for women to succeed in mathematics, as well as in other non-traditional fields. Some of their teaching strategies such as the sharing of relevent personal experiences have reflected this concern.

VI. TEACHERS' RECOMMENDATIONS FOR CHANGE

Teachers were asked whether they had any suggestions regarding changes which should be made in the segregated mathematics program. Those who thought segregated classes should be discontinued were asked to suggest other strategies which might encourage females to continue in math courses. Since all teachers, including those who had expressed some reservations about the program, indicated that the program should continue at least long enough to be fully evaluated or be provided on an optional basis, their suggestions focused on activities which could be done in addition to sex segregation.

Three teachers suggested that the program might be more effective if it were implemented with younger students (e.g. junior high level). However, one of these teachers was not sure that younger students would be sufficiently mature to be of much support to each other. Another staff member felt that the impact of such a program might be greater at a lower socio-economic status school where females are less likely than girls at A.Y. Jackson to acknowledge that they should take math. Concern was expressed by another teacher that the fact that general math courses were not segregated may communicate to students that the administration and teaching staff are less concerned about general level students. In his view, segregation should be introduced to all students at both levels or not at all, or should be made optional at both levels. One female teacher also suggested that participation in the program become optional.

Other suggestions involved increasing the emphasis placed on existing aspects of the program and included the following:

- increase the emphasis on informing students of the importance of math to a wide variety of career choices
- increase students' awareness that the demand for knowledge of math will increase in the years ahead
- introduce more and better materials in math classes (e.g. speakers and films) to illustrate the need for math and provide examples of women who have succeeded in math and science
- increase the level of encouragement provided to students
- ensure that appropriate, non-sexist examples are provided in math problems.

One teacher commented that students are very marks-oriented and tend to avoid, if at all possible, math and other courses that are perceived as difficult because they fear obtaining low grades. Thus, the relevance of math to careers and as a way of training students to work logically must be heavily emphasized. Another teacher suggested that there is a need for more professional development focused on how teaching styles can be adapted to suit possible sex differences in learning styles. This teacher has read that girls may require more "hands-on" examples and experiences but is unsure how to do this for specific math topics. Two teachers emphasized the importance of carefully selecting teachers for the segregated math program. Not all teachers believe in females' potential to excel in non-traditional areas. Furthermore, because male teachers do not provide same-sex role models, the message that women can succeed in math cannot be conveyed as convincingly.

VII. SUMMARY

As part of the second year of a pilot program designed to improve female students' attitudes toward mathematics and to increase the enrolment of females in upper level math courses, students enrolled in grades 10 and 11 advanced math were streamed by sex. Students who enrol in grade 10, 11 and 12 advanced math will be placed in sex-segregated classes in the 1986 - 87 academic year. The ultimate test of this program's impact will come in grades 12 and 13 with an examination of male and female math enrolment of these students.

In evaluating the effectiveness of segregated classes, this study has focused on four main areas: attitudes, achievement, enrolment and perceptions of the program. The main findings in each of these areas are summarized below.

The longitudinal analysis of attitudes towards mathematics for students who were in grade 11 in 1985 - 86 provided some evidence that segregated classes have had a beneficial effect on female students' attitudes. Increases in students' anxiety about math and decreases in their confidence about learning math which occurred between grades 10 and 11 were significantly greater at the comparison school than at A.Y. Jackson for students of both sexes. Females at A.Y. Jackson showed virtually no change by the end of grade 11 on either attitude scale and were significantly less anxious about math than both males at A.Y. Jackson and students at the comparison school, and were more confident about their ability to learn math than females at the comparison school. Males at A. Y. Jackson expressed attitudes that were quite similar for both scales to those of students at the comparison school. At the end of grade 11, females at A.Y. Jackson also felt that their teachers had more positive attitudes towards them as learners of mathematics, and that their mothers were more encouraging of their participation in mathematics than was true for either males at A. Y. Jackson or students at the comparison school. Students in the latter groups expressed similar attitudes on these two scales. This pattern suggests that segregated classes have had additional benefits for these grade 11 female students.

Some differences in the attitudes of students at the two schools were found for those who were in grade 10 in 1985 - 86 which had not been found for grade 10 students in 1984 - 85. None of these differences suggested that segregated classes had had a beneficial impact. Because of time constraints imposed by semestering, pre-test attitudes could not be assessed for these students. Thus, the school differences which were found may reflect unmeasured, pre-existing differences between these two samples. Data to be collected in 1986 - 87 may help to clarify these findings.

Despite the fact that no benefits of segregated classes were found on the mathematics attitudes scales for students who were in grade 10 in 1985 - 86, a larger proportion of them thought that the program had been effective in improving attitudes than was found for grade 10 students in the previous year (one third versus approximately one quarter of students in these two years, respectively). Slightly less than one quarter of the grade 11 students thought the program had a positive impact on attitudes, a proportion similar to that found for these same students when they were in grade 10. For students at both grade levels, males were significantly more likely than females to state that the program did not have a beneficial effect on attitudes.

As was found in Year I, 28 percent of parents thought that the program had been effective in improving students' attitudes, whereas about one third were unsure about its effects. There was a tendency for the parents of males to be less likely than parents of females to indicate that the program had such benefits, although it was not statistically significant. Benefits of segregated classes in areas related to student attitudes and confidence were noted by a number of teachers. Teachers of all female classes indicated that students feel more comfortable in segregated classes, and are generally less hesitant to ask questions and volunteer answers. Similar benefits were cited by three of the eight teachers of male classes, with one commenting that segregated classes provide female students with the opportunity to develop skills in math without having to fight negative attitudes or teasing from males.

At the grade 11 level, about 65 percent of both males and females at A.Y. Jackson and females at the comparison school aspired to careers for which grade 13 math was either required or recommended. A somewhat larger proportion of males at the comparison school (74%) had such aspirations. These results are generally similar to the post-test results reported in Year I when these students were in grade 10. A.Y. Jackson students of both sexes who were in grade 10 in 1985 - 86 were somewhat less likely to aspire to careers for which grade 13 math was required or recommended than their grade 10 counterparts had been in the previous year. In contrast, grade 10 students at the comparison school were more likely to aspire to such careers in Year II than their counterparts had been in Year I. Furthermore, students of both sexes at the comparison school were more likely to have such career aspirations than students at A.Y. Jackson. Because it was not possible to collect pre-test data from this second cohort of grade 10 students, the possibility remains that there were initial differences between the Year I samples of grade 10 students at the two schools, and that the segregated math program has little to do with the school differences which were found for these students.

Examination of the proportion of males and females in mathematics courses at the two schools revealed two notable changes. In 1985 - 86, 39 percent of grade 13 algebra students at A.Y. Jackson were female, representing a significant 20 percent increase over the previous year. At the comparison school, the 10 percent increase to 35 percent females enrolled in algebra was not large enough to suggest that there had been significant shifts in class composition over time. The class composition of calculus courses was unchanged at the comparison school, remaining at about 41 percent female. However, at A.Y. Jackson the 9 percent increase to 51 percent females in calculus was large enough to suggest that there had been a shift in enrolment patterns over time (which was of borderline significance). The increases in female students' enrolment in grade 13 algebra and calculus may represent a "spill-over" effect of the segregated math program to other students in the school.

The analysis of data regarding student achievement in mathematics indicates that there have been changes over time in final math marks, but that the pattern of these changes differs at the two schools. For students in grade 11 in 1985 - 86, no differences between schools were found for their grade 9 marks. By grade 10, marks of students at A.Y. Jackson had declined, most noticeably for males, but increased for students of both sexes at the comparison school. By grade 11, marks of males and females at the comparison school dropped to the same level as

the marks of females at A. Y. Jackson. The grade 11 marks of males at A.Y. Jackson remained relatively stable, but were lower than those of the remaining groups of students. It seems unlikely that the segregated math program has had a significant impact on the achievement levels of females since their grade 11 final marks did not differ from those of students of either sex at the comparison school. From these data, it is possible that males at A.Y. Jackson were placed at a disadvantage by the segregated math program.

For students who were in grade 10 in 1985 - 86, grade 9 final marks of students at the two schools were quite similar for both sexes. By grade 10, marks had declined for all students but to a significantly greater extent at A.Y. Jackson. The decline in marks for males at A.Y. Jackson was similar to the decline for females, contrary to the greater disadvantage which was found for males in the other sample. Although the segregated math program appears to be associated with lower marks, interpretation of these findings may be quite complex. Uncontrolled factors such as school differences in curricula, marking schemes and semestering may have contributed to the differences in final marks which were found at the two schools. It should be noted that the school differences in standardized achievement test performance which were found were nonsignificant for Cohort I, and statistically significant but small in magnitude for Cohort II. These results provide further evidence that school differences in final marks may be attributable to other factors than sex segregation.

The majority of teachers at A.Y. Jackson did not think that segregated classes have had any effect on student achievement in mathematics. Somewhat less than half of all students at both grade levels thought that segregation had not been effective in improving students' achievement in math. There was a trend for males to express this view more often than females but it was not statistically significant. About 30 percent of students thought that the program had been effective, with the most favourable views being expressed by females who were in grade 10 in 1985 - 86. About 40 percent of parents thought that segregated classes had not improved their children's math achievement. The parents of males tended to express this view somewhat more often than the parents of females. Slightly more than one quarter of all parents thought the program had benefitted achievement. Girls were much more likely than boys to state that participation in segregated math classes had been a positive experience. Parents opinions provided some confirmation in that parents of boys were less likely to state that the classes had been a positive experience for their children.

As reported in Year I, the largest percentage of comments made by parents and students reflected the belief that attitudes and achievement were not affected by segregated classes. Respondents felt that considerations such as student ability or motivation and the teacher's competance were more important. Some respondents indicated that segregation has likely had little impact on the majority of students, but may have been beneficial for some individuals, while others suggested that they have insufficient information to evaluate the program's impact. The majority of the remaining comments focused on positive and negative aspects of the program. Among the positive features, a more relaxed atmosphere in which students feel less hesitant asking questions and volunteering answers, less embarassment and less tension was the most frequently

cited benefit particularly by female students and their parents. Students and parents also frequently commented that there are fewer distractions, it is easier to work with students and teachers of the same sex, and that self confidence has improved. Respondents who made negative comments regarding the program stated that segregated classes are unnecessary, boring, noisier or more unruly. Such comments were made more often by males than females. Some students and parents thought that the classes may reinforce in both sexes the idea that boys are better in math than girls, and that it is important that students learn how to work with members of the opposite sex.

The majority of teachers feel that the program has been worthwhile, offering a number of benefits for female students and at worst, providing a neutral experience for males. Those teaching female classes commented on the more open atmosphere and greater supportiveness in the classes, the value of providing female role models, and female students' increased awareness that they can extend themselves and do well in math. Benefits cited by some of the male teachers included a broadened perspective on issues related to sex bias and greater awareness of the difficulties students of both sexes encounter in math. All teachers, including those who questioned the program's merits, indicated that the program should be made optional or continued at least long enough to allow a full evaluation.

APPENDIX A

A.Y. JACKSON SECONDARY SCHOOL

Student Questionnaire
1985-86

Your answers will be kept **strictly confidential** and will not be reported to your teacher. We in the research department do ask that you put your name on the questionnaire. This is the only way we can match up all the information which is necessary to interpret the results of the survey.

Name: _____

A. SEX: Male ☐ Female ☐

B. Please read each of the following statements carefully and indicate the extent which you agree or disagree with each statement.

	Strongly Agree 1	2	3	4	5	Strongly Disagree 6
1. Being regarded as smart in mathematics would be a great thing.	☐	☐	☐	☐	☐	☐
2. Studying mathematics is just as appropriate for women as for men.	☐	☐	☐	☐	☐	☐
3. I get a sinking feeling when I think of trying hard math problems.	☐	☐	☐	☐	☐	☐
4. My mother wouldn't encourage me to plan a career which involves math.	☐	☐	☐	☐	☐	☐
5. I'm no good in math.	☐	☐	☐	☐	☐	☐
6. My teachers have encouraged me to study more mathematics.	☐	☐	☐	☐	☐	☐
7. I expect to have little use for mathematics when I get out of school.	☐	☐	☐	☐	☐	☐
8. I don't understand how some people can spend so much time on math and seem to enjoy it.	☐	☐	☐	☐	☐	☐
9. My father thinks that mathematics is one of the most important subjects I have studied.	☐	☐	☐	☐	☐	☐

		Strongly Agree 1	2	3	4	5	Strongly Disagree 6
10.	It would make me happy to be recognized as an excellent student in mathematics.	☐	☐	☐	☐	☐	☐
11.	Males are not naturally better than females in mathematics.	☐	☐	☐	☐	☐	☐
12.	I usually have been at ease during math tests.	☐	☐	☐	☐	☐	☐
13.	My mother has shown no interest in whether or not I take more math courses.	☐	☐	☐	☐	☐	☐
14.	I can get good grades in mathematics.	☐	☐	☐	☐	☐	☐
15.	Getting a mathematics teacher to take me seriously has usually been a problem.	☐	☐	☐	☐	☐	☐
16.	Mathematics is of no relevance to my life.	☐	☐	☐	☐	☐	☐
17.	I am challenged by math problems I can't understand immediately.	☐	☐	☐	☐	☐	☐
18.	My father has strongly encouraged me to do well in mathematics.	☐	☐	☐	☐	☐	☐
19.	I'd be happy to get top grades in mathematics.	☐	☐	☐	☐	☐	☐
20.	I would have more faith in the answer for a math problem solved by a man than a woman.	☐	☐	☐	☐	☐	☐
21.	Mathematics usually makes me feel uncomfortable and nervous.	☐	☐	☐	☐	☐	☐
22.	My mother thinks that mathematics is one of the most important subjects I have studied.	☐	☐	☐	☐	☐	☐
23.	I'm not the type to do well in math.	☐	☐	☐	☐	☐	☐
24.	Math teachers would think I wasn't serious if I told them I was interested in a career in science and mathematics.	☐	☐	☐	☐	☐	☐
25.	Mathematics will not be important to me in my life's work.	☐	☐	☐	☐	☐	☐
26.	Mathematics is enjoyable and stimulating to me.	☐	☐	☐	☐	☐	☐

		Strongly Agree 1	2	3	4	5	Strongly Disagree 6
27.	My father wouldn't encourage me to plan a career which involves math.	☐	☐	☐	☐	☐	☐
28.	It would be really great to win a prize in mathematics.	☐	☐	☐	☐	☐	☐
29.	I would trust a woman just as much as I would trust a man to figure out important calculations.	☐	☐	☐	☐	☐	☐
30.	My mind goes blank and I am unable to think clearly when working mathematics.	☐	☐	☐	☐	☐	☐
31.	My mother has strongly encouraged me to do well in mathematics.	☐	☐	☐	☐	☐	☐
32.	Generally, I have felt secure about attempting mathematics.	☐	☐	☐	☐	☐	☐
33.	My math teachers have been interested in my progress in mathematics.	☐	☐	☐	☐	☐	☐
34.	Mathematics is a worthwhile and necessary subject.	☐	☐	☐	☐	☐	☐
35.	Figuring out mathematical problems does not appeal to me.	☐	☐	☐	☐	☐	☐
36.	My father has shown no interest in whether or not I take more math courses.	☐	☐	☐	☐	☐	☐
37.	I don't like people to think I'm smart in math.	☐	☐	☐	☐	☐	☐
38.	Girls can do just as well as boys in mathematics.	☐	☐	☐	☐	☐	☐
39.	I usually have been at ease in math classes.	☐	☐	☐	☐	☐	☐
40.	For some reason even though I study, math seems unusually hard for me.	☐	☐	☐	☐	☐	☐
41.	My teachers think I'm the kind of person who could do well in mathematics.	☐	☐	☐	☐	☐	☐
42.	Knowing mathematics will help me earn a living.	☐	☐	☐	☐	☐	☐

		Strongly Agree 1	2	3	4	5	Strongly Disagree 6
43.	I do as little work in math as possible.	☐	☐	☐	☐	☐	☐
44.	People would think I was some kind of a browner if I got A's in math.	☐	☐	☐	☐	☐	☐
45.	I would expect a woman mathematician to be a masculine type of person.	☐	☐	☐	☐	☐	☐
46.	I haven't usually worried about being able to solve math problems.	☐	☐	☐	☐	☐	☐
47.	I am sure that I can learn mathematics.	☐	☐	☐	☐	☐	☐
48.	It would make people like me less if I were a really good math student.	☐	☐	☐	☐	☐	☐
49.	Girls who enjoy studying math are a bit peculiar.	☐	☐	☐	☐	☐	☐
50.	If I had good grades in math, I would try to hide it.	☐	☐	☐	☐	☐	☐
51.	It's hard to believe a female could be a genius in mathematics.	☐	☐	☐	☐	☐	☐

C. Please consider the following list of careers and indicate:

i) which career is most closely related to the **career you would most like to have if there was nothing to limit or prevent you**

ii) which **career** you actually **expect to have** in the future

Read the entire list carefully before making your selection.

	Career I would most like to have (Select one)	Career I expect to have (Select one)
Computer Programmer	☐	☐
Real Estate Agent	☐	☐
Veterinarian	☐	☐
Lawyer	☐	☐
Registered Nurse	☐	☐
Elementary School Teacher	☐	☐
Flight Attendant	☐	☐
Photographer	☐	☐
Forester	☐	☐
Personnel Director	☐	☐
Manager of a Business, Bank	☐	☐
Chiropractor	☐	☐
Social Worker	☐	☐
Dental Assistant	☐	☐
Sales Person	☐	☐
Dentist/Orthodontist	☐	☐
Homemaker	☐	☐

(list continued on next page)

	Career I would most like to have	Career I expect to have
Pilot	☐	☐
Interior Decorator	☐	☐
Architect	☐	☐
Engineer	☐	☐
Doctor	☐	☐
Secretary	☐	☐
Priest/Minister/Rabbi	☐	☐
Musician/Artist/Actress/Actor	☐	☐
Police Officer	☐	☐
Beautician	☐	☐
Secondary School Teacher in _____ (subject)	☐	☐
Writer/Editor/Journalist/Reporter	☐	☐
Accountant	☐	☐
Psychologist	☐	☐
Physio Therapist	☐	☐
Hotel Manager	☐	☐
University Professor (Area _____)	☐	☐
Stockbroker	☐	☐
Other: _____ (please specify)	☐	☐

D. 1. Do you think that segregated classes are effective in improving students' attitudes towards mathematics?

Yes ☐ No ☐ Don't know ☐

Please explain: _____

_____

_____

2. Do you think that segregated classes are effective in improving students' achievement in mathematics?

Yes ☐ No ☐ Don't know ☐

Please explain: _____

_____

_____

3. In general, have you found segregated classes to be a positive experience?

Yes ☐ No ☐ Don't know ☐

Please explain: _____

_____

_____

4. Do you have any other comments about the concept of segregating math classes by sex?

_____

_____

_____

5. a) Are you taking mathematics this year?

Yes ☐ No ☐

If yes, what grade and level?

Grade 10 ☐ Advanced ☐
Grade 11 ☐ General ☐
Grade 12 ☐

If no, why did you decide to drop math? _____

_____

_____

b) Are you planning to take mathematics next year?

Yes ☐ No ☐

If yes, what level? Advanced ☐

General ☐

If no, why not? _____

_____

_____

6. a) Were you a student at A.Y. Jackson Secondary School last year (1984-85)?

Yes ☐ No ☐

b) If yes, did you fill out a similar questionnaire last year?

Yes ☐ No ☐

c) If you took math last year, what grade and level were you in?

Grade 9 ☐
Grade 10 ☐ Advanced ☐
Grade 11 ☐ General ☐
Grade 12 ☐

THANK YOU FOR YOUR CO-OPERATION

ERES
Revised
Dec/85

APPENDIX B

A.Y. Jackson Grade 10 Advanced Mathematics

Parent Questionnaire

1985-86

1. My son ☐ , daughter ☐ is enrolled in grade 10 advanced mathematics. (please check)

2. Are you aware that all grade 10 advanced mathematics classes at A.Y. Jackson Secondary School are segregated by sex?

   Yes ☐ No ☐

3. Do you feel that segregated classes are effective in improving students' attitudes towards mathematics?

   Yes ☐ No ☐ Don't know ☐

   Please explain: _____

   _____

   _____

4. Do you feel that segregated classes are effective in improving students' achievement in mathematics?

   Yes ☐ No ☐ Don't know ☐

   Please explain: _____

   _____

   _____

5. In general, have segregated classes been a positive experience for your child?

   Yes ☐ No ☐ Don't know ☐

   Please explain: _____

   _____

   _____

6. Are there any other comments you'd like to make regarding segregated mathematics classes?

_____

_____

_____

7. How important is it for your child to study mathematics?

Very important		Somewhat important		Not at all important
☐	☐	☐	☐	☐

8. Have you ever discussed career possibilities with your child?

Yes ☐ No ☐

THANK YOU FOR YOUR CO-OPERATION

Please return the completed questionnaire
in the attached self-addressed envelope
by 12 June 1986

APPENDIX C

TEACHER INTERVIEW

SEX-SEGREGATED MATHEMATICS

Background Information

1. Sex
2. How many years have you been teaching?
3. How many years have you been teaching at A.Y. Jackson?
4. Where were you before that?
5. How many years have you been teaching Math?
6. Are you teaching both segregated and mixed classes this year (specify sex and grade level of each class)?

Sex-segregated Math

1. Were you ever aware of any differences between the attitudes and achievement levels of male and female students in your Math classes? If yes, please explain.

2. What effect, if any, have segregated classes had on student:
   - attitudes
   - confidence (Give specific examples)
   - expectations
   - achievement
   - behaviour?

3. (a) If you have both male and female segregated classes, have you noticed any differences between these groups in terms of:
   - attitudes
   - confidence (Give specifice examples)
   - expectations
   - achievement
   - behaviour?

   (b) If you have both male and female segregated classes, have you noticed any differences in the classroom atmosphere? If yes, please explain.

4. (a) Have your teaching styles, strategies and expectations changed in any way as a result of segregated classes?

   (b) If you have both male and female segregated classes, do your teaching styles,strategies and expectations differ in male and female classes? If yes, please explain.

....con't.

5. (a) Do you feel that segregated classes are worthwhile?

   (b) Have segregated classes been a positive experience for - you
   - your students?

   (c) Should sex-segregated classes be continued?

   (d) Do you have any changes to suggest?

   (e) If you think segregated classes should be discontinued, do you have any suggestions about other methods to encourage females to continue in mathematics courses?

6. Any other comments?

APPENDIX D

Analysis of Attitude Scales - Cohort I Students

Source	Approximate Multivariate F (9,244 d.f)	
Between		
Sex	6.03	***
School	1.22	
Sex x School	1.21	
Within		
Time	3.44	***
Sex x Time	.73	
School x Time	1.95	*
Sex x School x Time	.63	

* $p < .05$

*** $p < .001$

Attitude Scales - Cohort I

Univariate F Tests (1,252 d.f.) Corresponding to the Significant Multivariate Effects

	Multivariate Effect		
	Sex	Time	School x Time
Attitude Scales	F Ratio	F Ratio	F Ratio[1]
Success in Math	21.52 ***	1.69	1.62
Male Domain	35.66 ***	.31	.04
Math Anxiety	.00	9.26 **	3.66 (p=.057)
Mother	5.89 *	1.39	.17
Confidence in Math	.29	14.80 ***	3.77 (p=.053)
Teacher	5.98 *	4.10 *	.29
Usefulness of Math	1.16	21.49 ***	1.03
Effectance Motivation	4.67 *	4.77 *	2.80
Father	.48	9.80 **	1.15

* $p < .05$
** $p < .01$
*** $p < .001$

1. Despite the fact that the multivariate test for the interaction of school and time was significant, none of the univariate tests on the individual attitude scales were statistically significant at the .05 level. However, this interaction was of borderline significance for two of the nine scales. This somewhat anomalous situation can arise when some or all of the dependent variables are substantially correlated with each other. Taken together, they may result in a significant multivariate effect.

APPENDIX E

Analysis of Attitude Scales - Cohort II Students

Source	Approximate Multivariate F (9,554 d.f.)
Sex	15.61 ***
School	2.45 **
Sex x School	1.22

** p < .01
*** p < .001

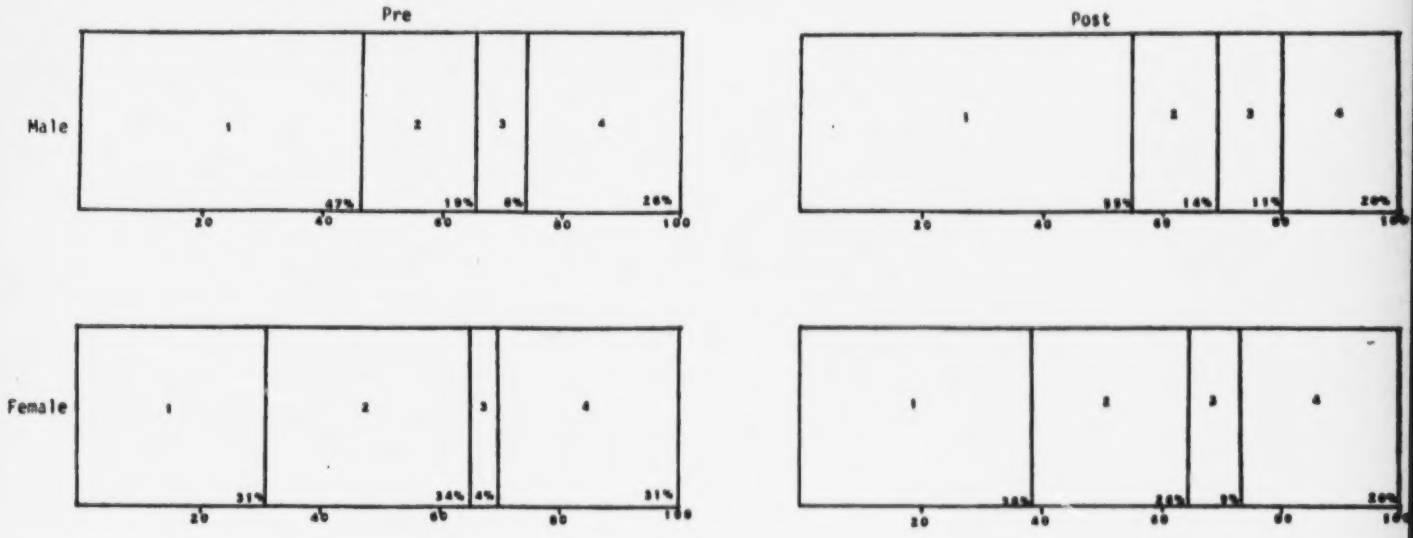
Univariate F Tests (1,562 d.f.) Corresponding to the Significant Multivariate Effects

	Multivariate Effect	
	Sex	School
Attitude Scales	F Ratio	F Ratio
Success in Math	15.99 ***	.00
Male Domain	77.97 ***	1.81
Math Anxiety	11.86 ***	14.05 ***
Mother	.00	.14
Confidence in Math	15.52 ***	9.92 **
Teacher	3.44 (p =.06)	1.14
Usefulness of Math	5.23 *	8.09 **
Effectance Motivation	2.00	1.20
Father	8.07 **	.61

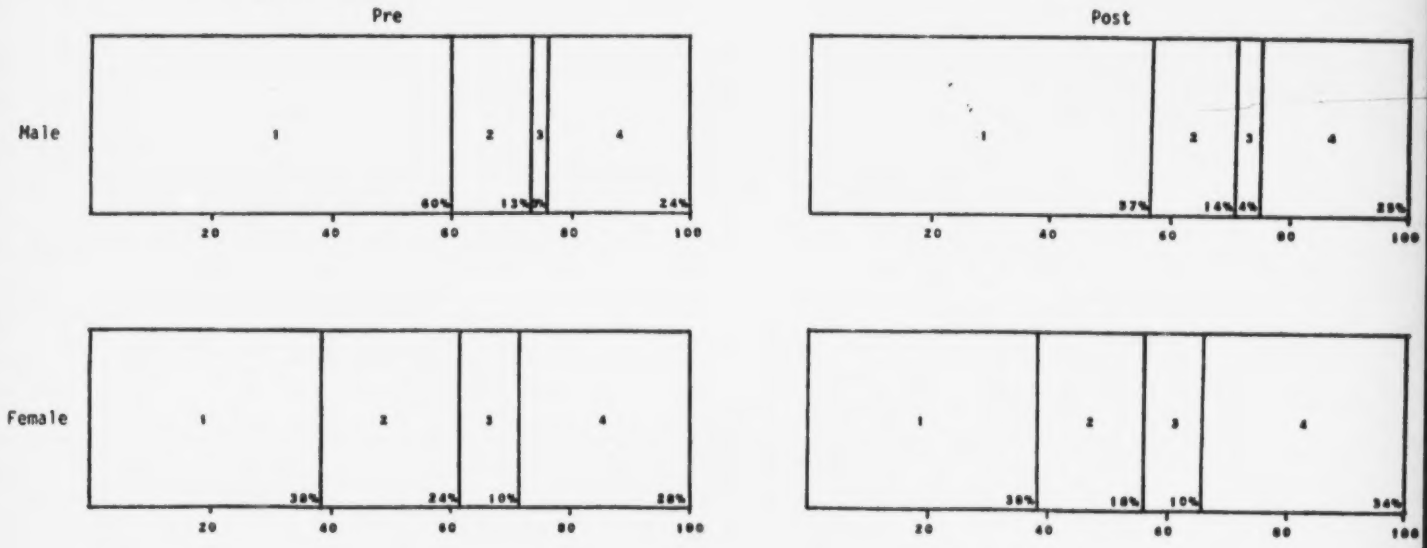
* p < .05
** p < .01
*** p < .001

Extent to Which Career Aspirations of Students Involve a Knowledge at Mathematics

A. Y. Jackson Secondary School



Comparison School



1. Grade 13 mathematics required
2. Grade 13 mathematics recommended
3. Grade 12 mathematics required
4. Grade 11 mathematics or less

APPENDIX G

Analysis of Final Math Marks - Cohort I Students

Source	SS	df	MS	F	
Between					
Sex	3608.06	1	3608.06	8.70	**
School	2746.09	1	2746.09	6.62	**
Sex x School	500.88	1	500.88	1.21	
Within cells	169151.42	408	414.59		
Within (Averaged Tests of Significance)[1]					
Time	1460.16	2	730.08	13.53	***
Sex x Time	86.06	2	43.03	.80	
School x Time	2311.38	2	1155.69	21.41	***
Sex x School x Time[2]	344.14	2	172.07	3.19	
Within Cells	44037.48	816			

** $p < .01$
*** $p < .001$

1. For the sake of simplicity, the summary table using a univariate approach (based on averaged tests of significance) is provided for this analysis. The results of the multivariate approach to the analysis of the Within Subjects effects are similar with the one exception noted below.

2. The sex x school x time interaction is significant at $p = .04$ using the univariate averaged approach but is not significant when the more appropriate multivariate approach is used. This interaction is assumed to be nonsignificant based on the more conservative multivariate approach, and will not be discussed.

APPENDIX H

Analysis of Final Math Marks - Cohort II Students

Source	SS	df	MS	F	
Between					
Sex	258.66	1	258.66	.93	
School	1667.43	1	1667.43	5.99	*
Sex x School	13.83	1	13.83	.05	
Within cells	177907.78	639	278.42		
Within					
Time	4878.24	1	4878.24	72.69	***
Sex x Time	30.10	1	30.10	.45	
School x Time	398.52	1	398.52	5.94	***
Sex x School x Time	41.88	1	41.88	.62	
Within Cells	42883.70	639	67.11		

Analysis of Achievement Test Scores - Cohort II Students

Source	SS	df	MS	F	
Sex	359.29	1	359.29	10.26	***
School	135.47	1	135.47	3.87	*
Sex x School	56.13	1	56.13	1.60	
Within cells	20161.78	576	35.00		

* $p < .05$
*** $p < .001$

APPENDIX I

Student Reactions to Sex-Segregated Mathematics Classes

Students at A.Y. Jackson were asked to discuss whether their experiences with the segregated math program had been positive. The following summarizes the comments made by students in response to this question.

	Gr. 10		Gr. 11	
Positive Experience	M %	F %	M %	F %
• students feel more comfortable and relaxed, and less intimidated in segregated classes - easier to participate in class	7	22	4	15
• fewer distractions, easier to concentrate on work and relate to the teacher - easier to work with students of the same sex	2	8	4	5
• segregated classes have been generally beneficial; math marks have improved	2	6	3	5
• segregated classes have been a new experience, it's been worthwhile to try something different	1	2	1	3
• segregated classes help girls realize math is important and teachers care about their success - girls feel better about math and try harder to do well - girls will get a better foundation in math	-	6	-	3
• segregated classes are easier to control	1	-	-	-
• segregated classes are beneficial because boys and girls have different ways of solving math problems and types of difficulties in math	1	-	-	-

	Gr. 10		Gr. 11	
	M %	F %	M %	F %
Negative Experience				
• segregated classes are boring, dull and less enjoyable - without the presence of the opposite sex, there is nothing to look forward to	10	1	8	4
• segregated classes make no difference or offer no apparent benefits. Therefore, the experience has been negative or a waste of time/effort.	4	4	7	7
• segregated classes are unnecessary, a bad idea and can reinforce in both sexes, the idea that boys are better in math - insulting to students' intelligence - students feel like guinea pigs - students may develop hardened attitudes to the system and resent math - degrading for female students	2	2	3	5
• math marks have worsened in segregated classes	4	3	3	2
• segregated classes are noisier, more unruly - too much socializing and/or clowning around	4	2	3	3
• student prefers mixed classes and did better in a mixed class (no other reasons offered)	3	2	1	1
• segregated classes are less challenging and competitive; students don't work as hard without the opposite sex to impress	2	1	1	1
• students have to learn to work with both sexes in the outside world - this is necessary to the growing up process	2	-	1	-
Neutral Experience				
• student has no preference regarding whether sex-segregation should continue - either way is fine; no opinion - experience neither positive nor negative because it has made no difference for them personally	15	11	9	13

	Gr. 10		Gr. 11	
	M %	F %	M %	F %
Neutral Experience (Continued)				
. attitudes and achievement are not affected by segregated classes - they depend on other factors such as student motivation or ability, the teacher or whether students like math	2	4	8	4
. there are both good and bad points to segregated classes - the experience has been partly positive, partly negative - the program should be made optional	-	4	1	4
. haven't given segregated classes much thought or have no basis for comparison - too soon to tell	3	2	2	3
. the effect of segregated classes depends on the individual - some have found the helpful; for others, the classes have made no difference	1	1	1	3
No Response	36	25	45	24

APPENDIX J

Parent Reactions to Sex-Segregated Mathematics Classes

Parents were surveyed regarding their perceptions of the effects of sex-segregated classes on their children's attitudes toward and achievement in mathematics. Their responses are summarized below. Percentages are based on the total number of parents who returned questionnaires (n = 77 for parents of males; n = 81 for parents of females).

Response	Attitude		Achievement	
	M %	F %	M %	F %
• attitudes or achievement are not affected by sex-segregated classes, but may be affected by student ability or motivation, teacher competance, class size or semestering	21	23	16	23
• students are less hesitant to answer questions, express difficulties and seek extra help; segregated classes are less pressured, more relaxed and more enjoyable	4	12	3	6
• segregated classes are unnecessary, useless; a bad idea; "feminist tinkering"; may benefit girls at the expense of boys	10	3	4	4
• without the opposite sex, there are fewer distractions; concentration on math is improved	8	5	10	10
• students feel better about math and are more confident; there are no boys present to convince the girls that the latter really are worse in math	1	6	-	2
• segregated classes imply that females are not as good in math as males; girls made to feel insecure and that they are "different" or "inferior" to boys; sex differences may be perpetuated	1	6	-	1
• it's too soon to tell; haven't thought about it; it's a worthwhile experiment; nothing is lost by trying it out	5	4	3	5

Response	Attitude M %	Attitude F %	Achievement M %	Achievement F %
. questions that there is evidence to support segregation of students by sex; interested in seeing the results of the study; to prove the program has merit, a solid control group is needed;	4	2	4	5
. segregated classes are noisier, more unruly, harder to control; students may be less attentive	3	1	3	-
. less challenge, competition in segregated classes (a negative feature); students try harder in mixed class to impress opposite sex; students must learn to work with opposite sex	-	3	-	4
. segregated classes are a good idea because boys are generally better in math or because girls' lower interest in math may make boys attitudes more negative	1	1	3	1
. less competition in segregated classes (a positive feature)	1	-	-	-
. instead of segregation, should emphasize importance of studying math and/or encourage development of positive attitudes toward all subjects	1	-	-	-
. would rather see classes streamed by ability, not sex	1	-	1	-
. by grade 10, it is too late to change attitudes or achievement	1	-	-	-
. student did not do as well in math (no reason specified)	1	-	-	1
. unaware that classes were segregated	3	-	-	-
. marks have improved this year	-	-	4	2
No Response	43	31	51	38

Parents' responses regarding whether the program had been a positive experience for their children are summarized below. The response categories developed for this question were quite similar to those summarizing responses to the attitude and achievement questions. Percentages are based on the total number of parents who returned questionnaires.

Response	Positive Experience M %	Positive Experience F %
. effects depend on student motivation or ability, teacher competance, class size, not on segregation of classes	14	11
. segregated classes are more relaxed, less pressured; easier for students to express difficulties, answer questions and seek extra help	1	12
. achievement has improved; marks are higher this year	3	7
. achievement is lower; marks went down this year	4	5
. segregated classes are unnecessary, useless; program is aimed at girls, at the boys' expense; no benefits are likely for boys	4	4
. it's too soon to tell; haven't thought about it; it's a worthwhile experiment; nothing is lost by trying it out; worth trying but wouldn't want to see all classes segregated	6	2
. segregated classes are noisier, more unruly and more difficult to control	4	2
. fewer distractions, easier to concentrate in segregated classes	3	1
. segregated classes are a good idea and should be continued	-	4
. less challenge and competition in segregated classes (a negative feature); classes are boring	1	2
. students must get used to working with the opposite sex; there is no opportunity to learn from members of opposite sex; students at this level should be mature enough to cope with an integrated class; it's important that students learn to do well in any situation	1	2

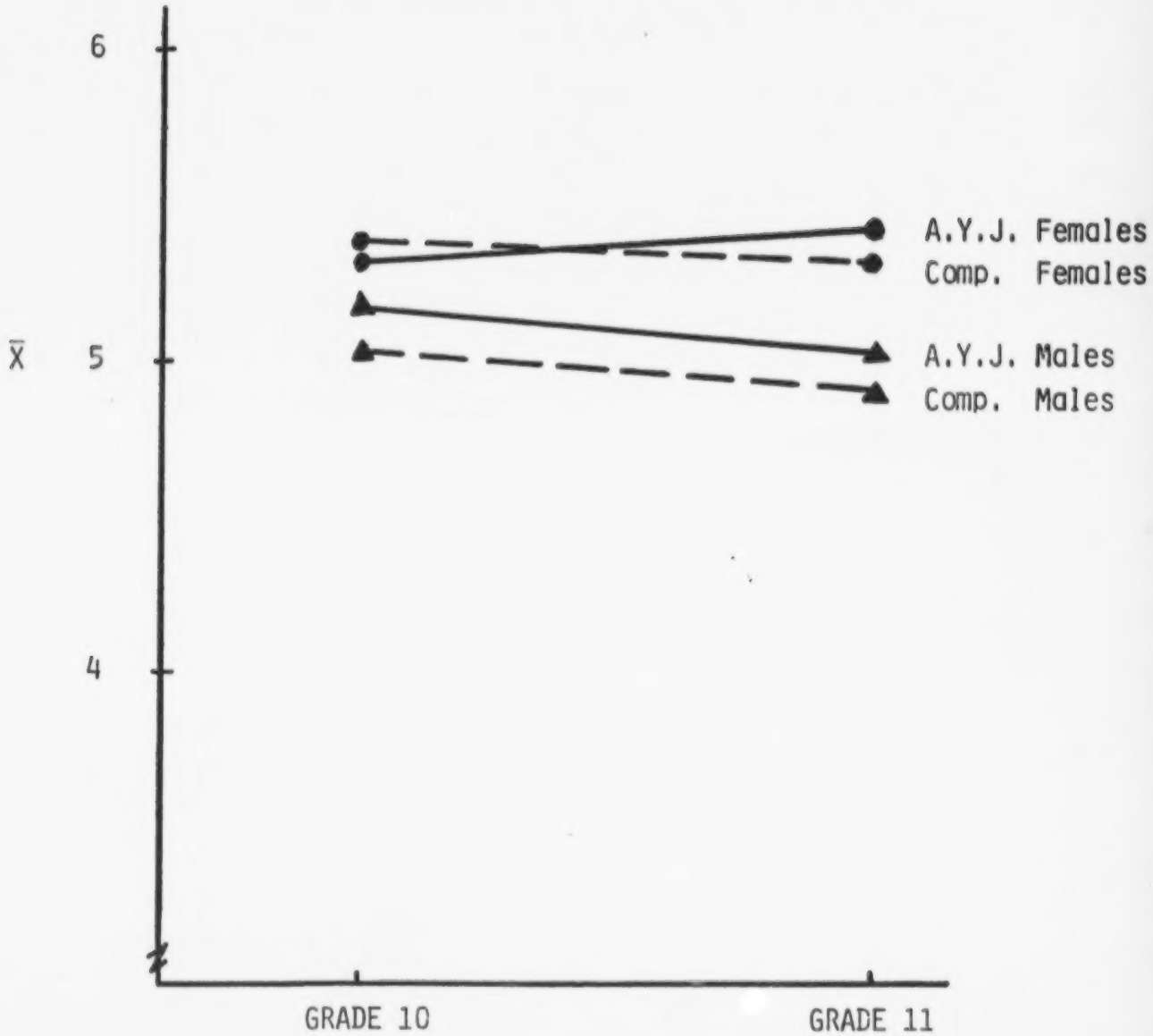
Response	Positive Experience M %	Positive Experience F %
. segregated classes imply that girls are not as good in math as boys; sex differences may be perpetuated	1	2
. would rather see classes streamed by ability than sex	-	1
. less competition in segregated classes (a positive feature)	-	1
. better rapport with the teacher	-	1
No Response	58	37

APPENDIX K

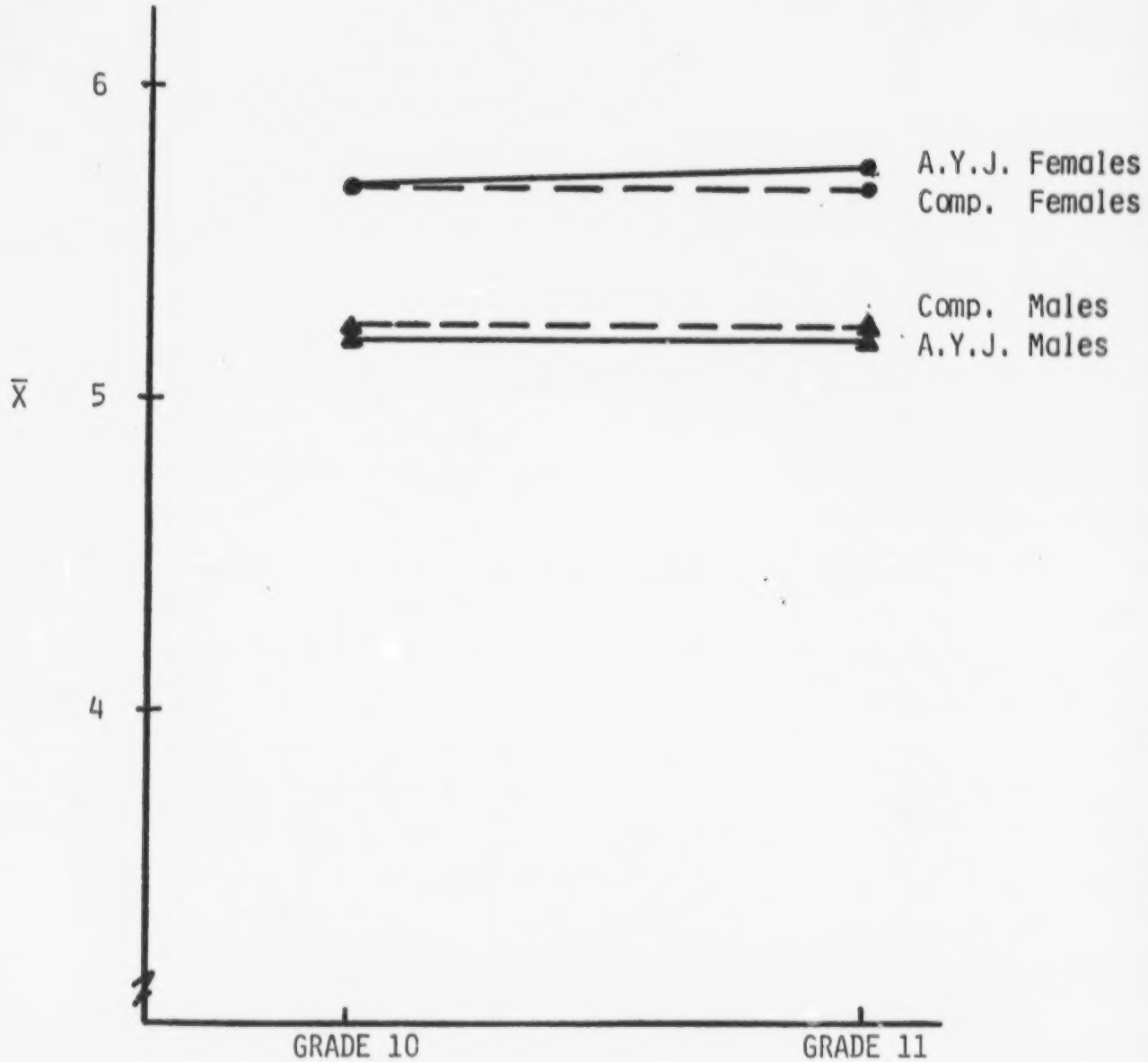
Plots of Cohort I Grade 10 and 11

Post-test Attitude Scores

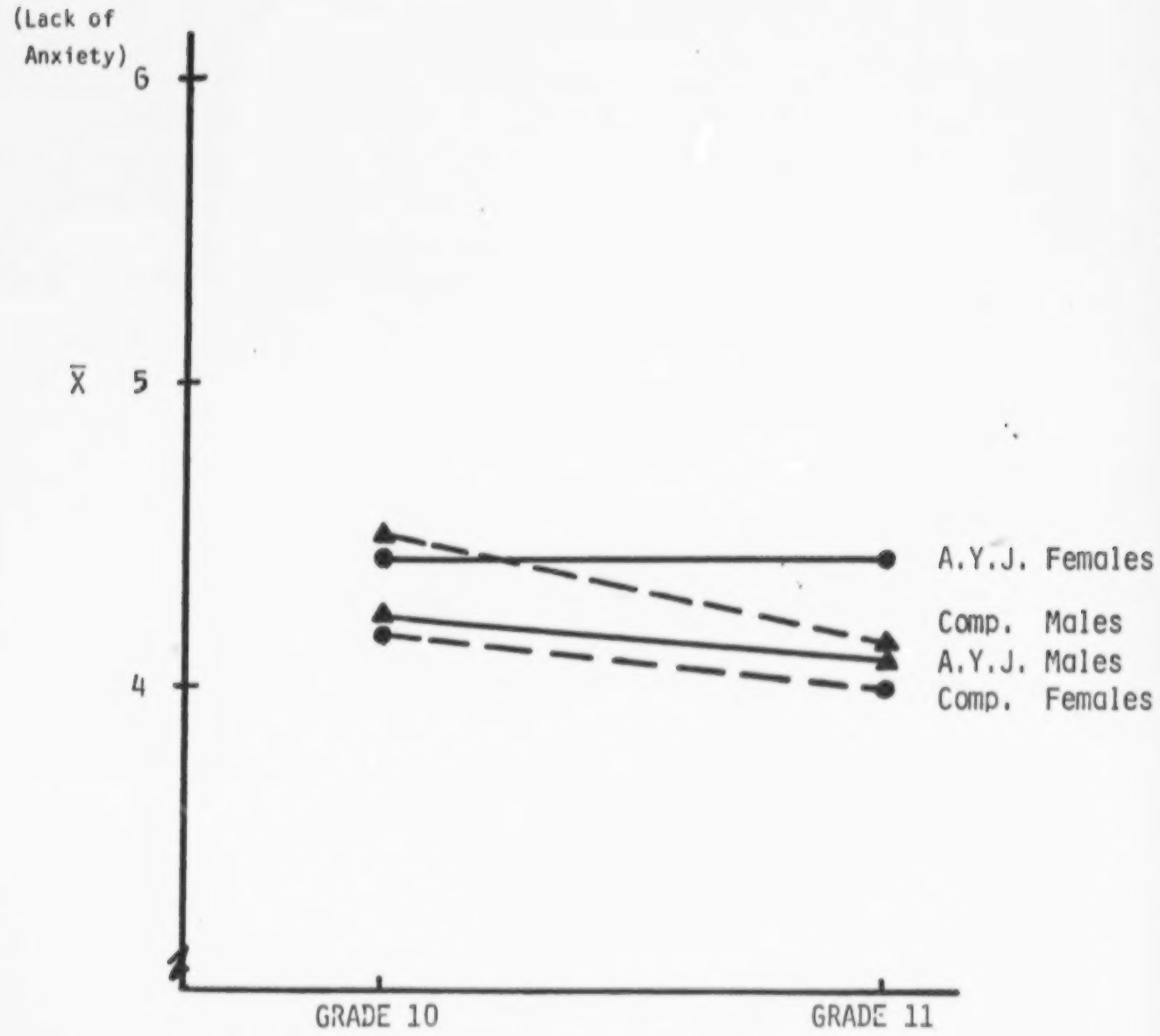
SUCCESS IN MATHEMATICS SCALE



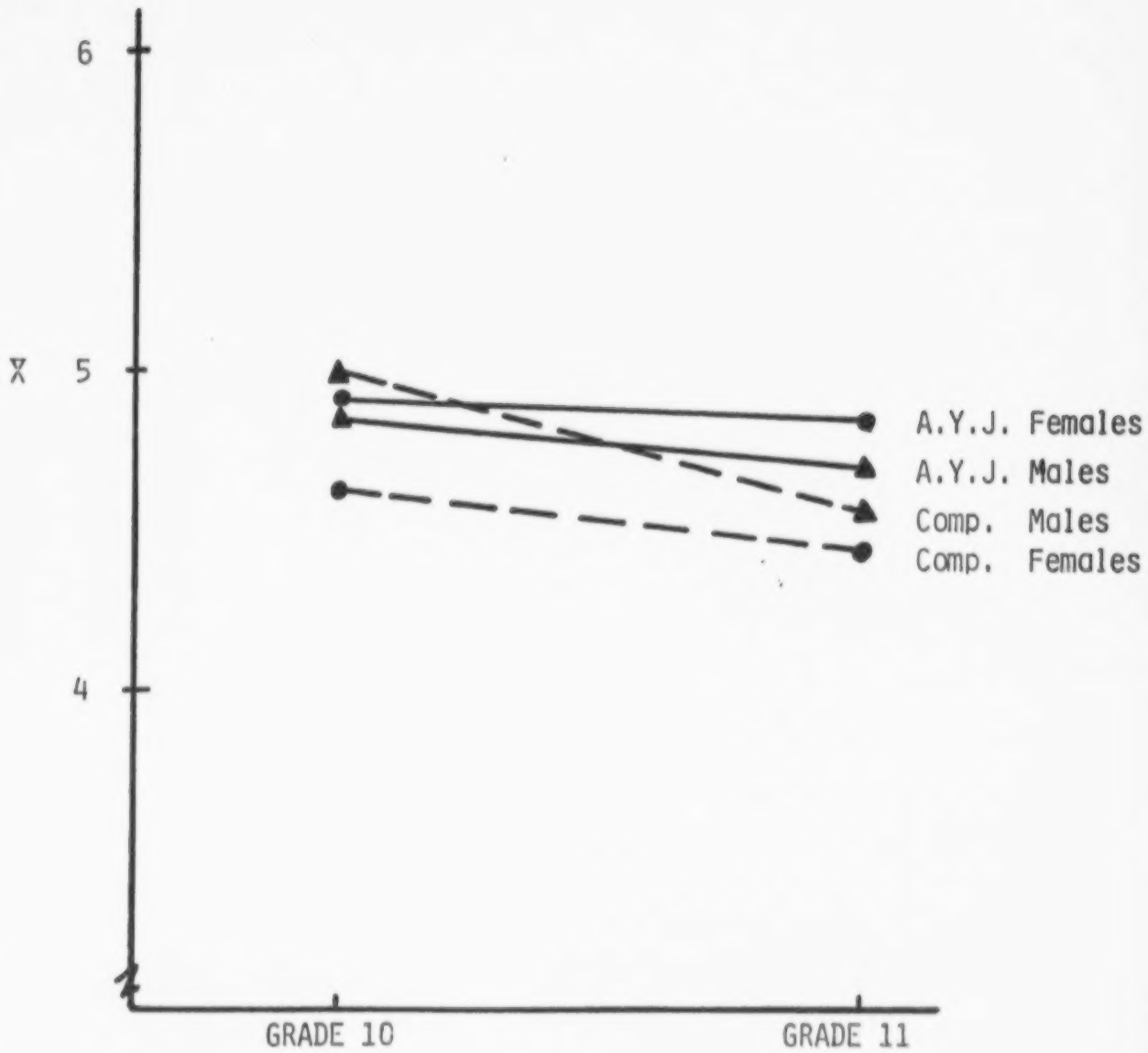
MATHEMATICS AS A MALE DOMAIN SCALE



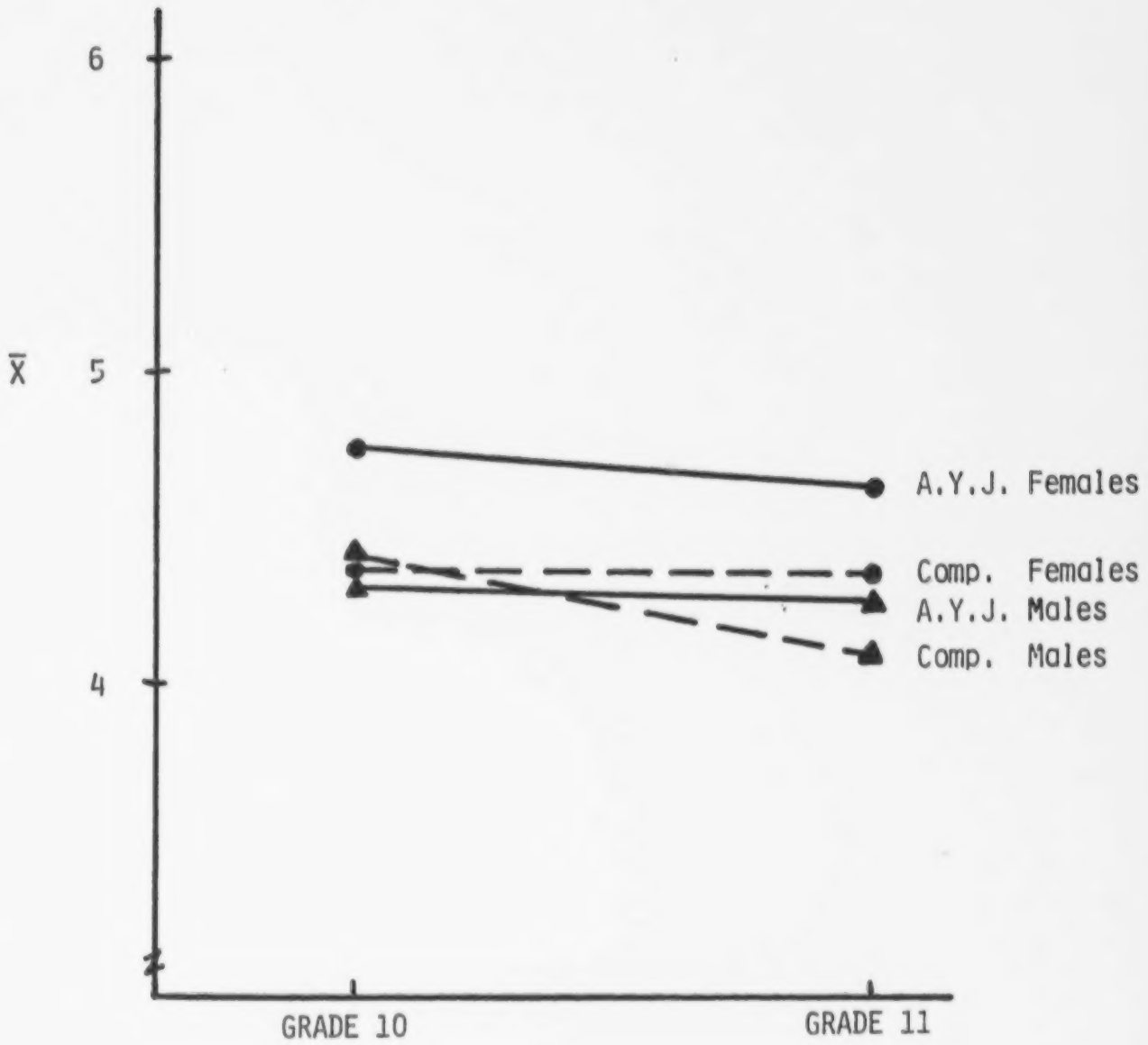
MATHEMATICS ANXIETY SCALE



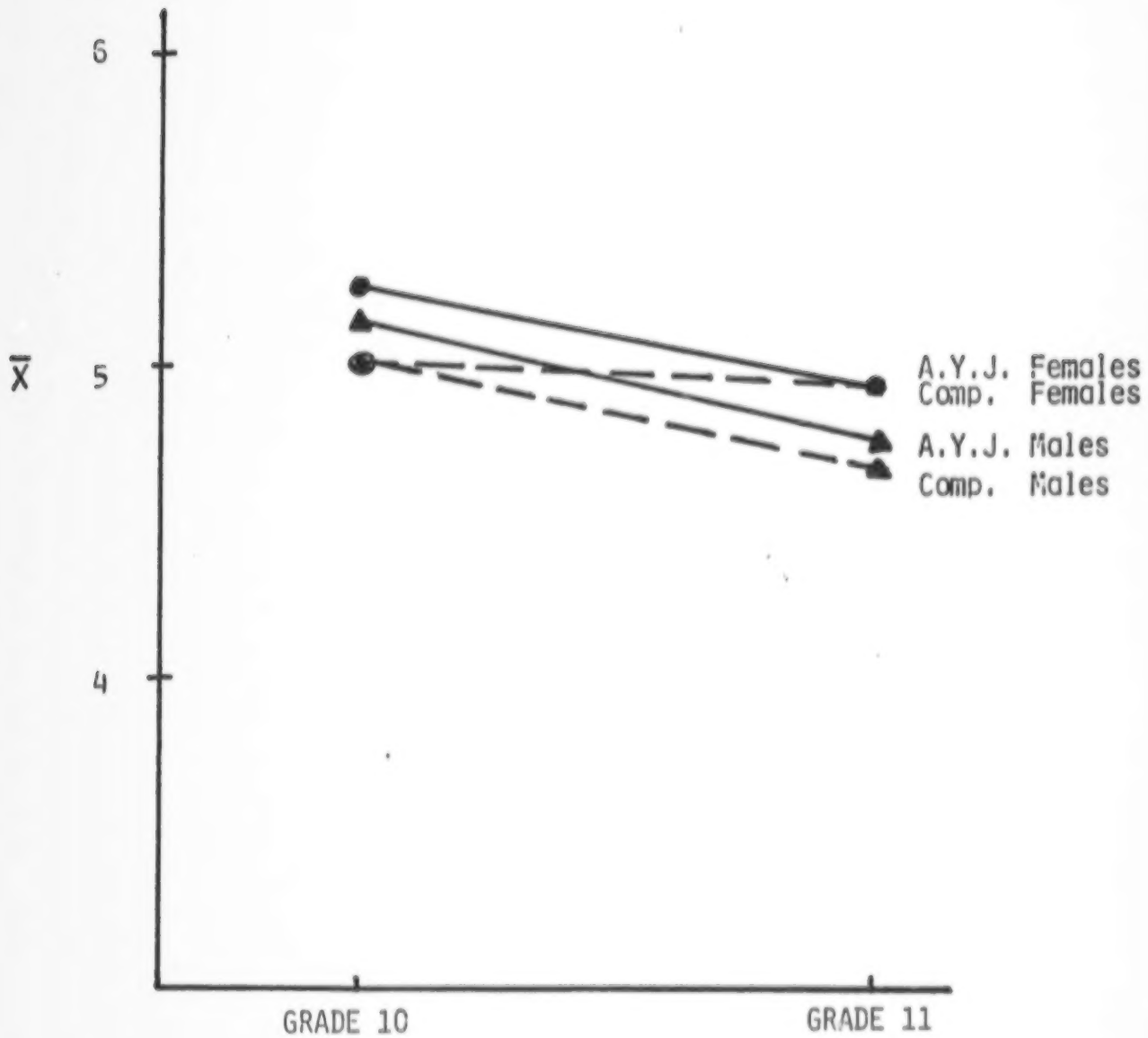
CONFIDENCE IN LEARNING MATH SCALE



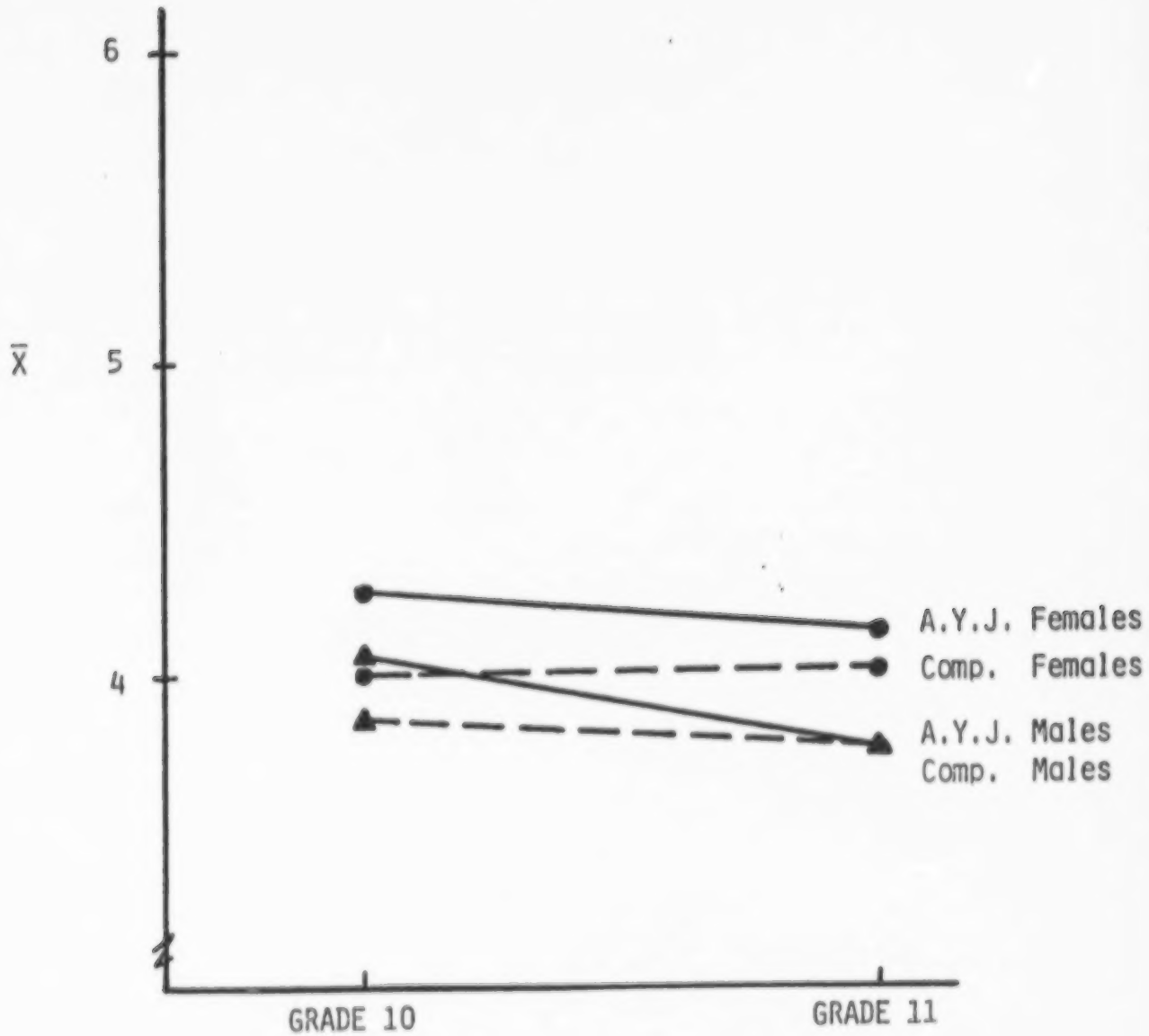
TEACHER SCALE



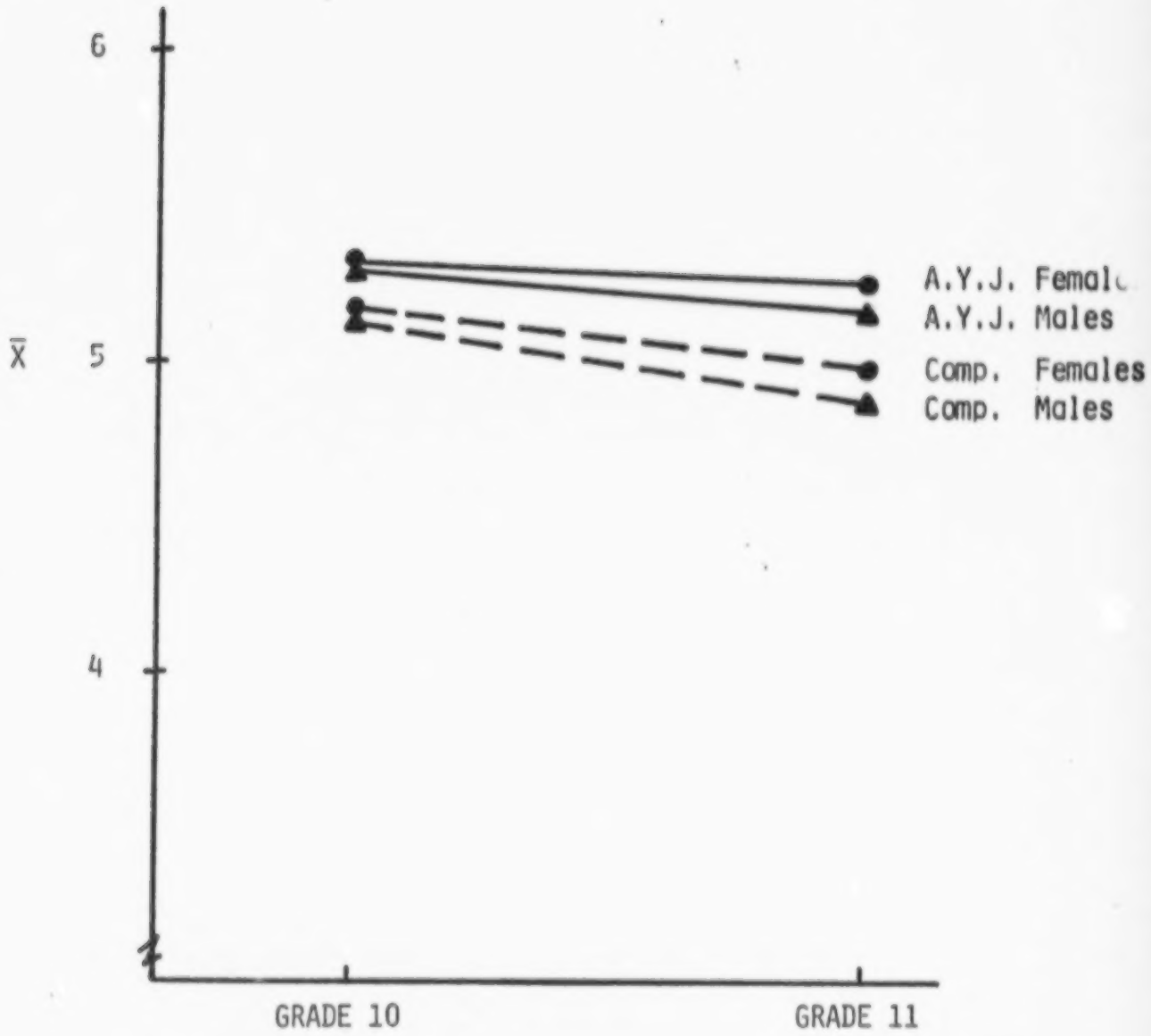
MATHEMATICS USEFULNESS SCALE



EFFECTANCE MOTIVATION SCALE



FATHER SCALE



MOTHER SCALE